

CERES Data Management System

Items for Discussion - March, 1996

Organization

Schedule

Development Process

Working Group Status - Release 1 development

Some 'metrics'

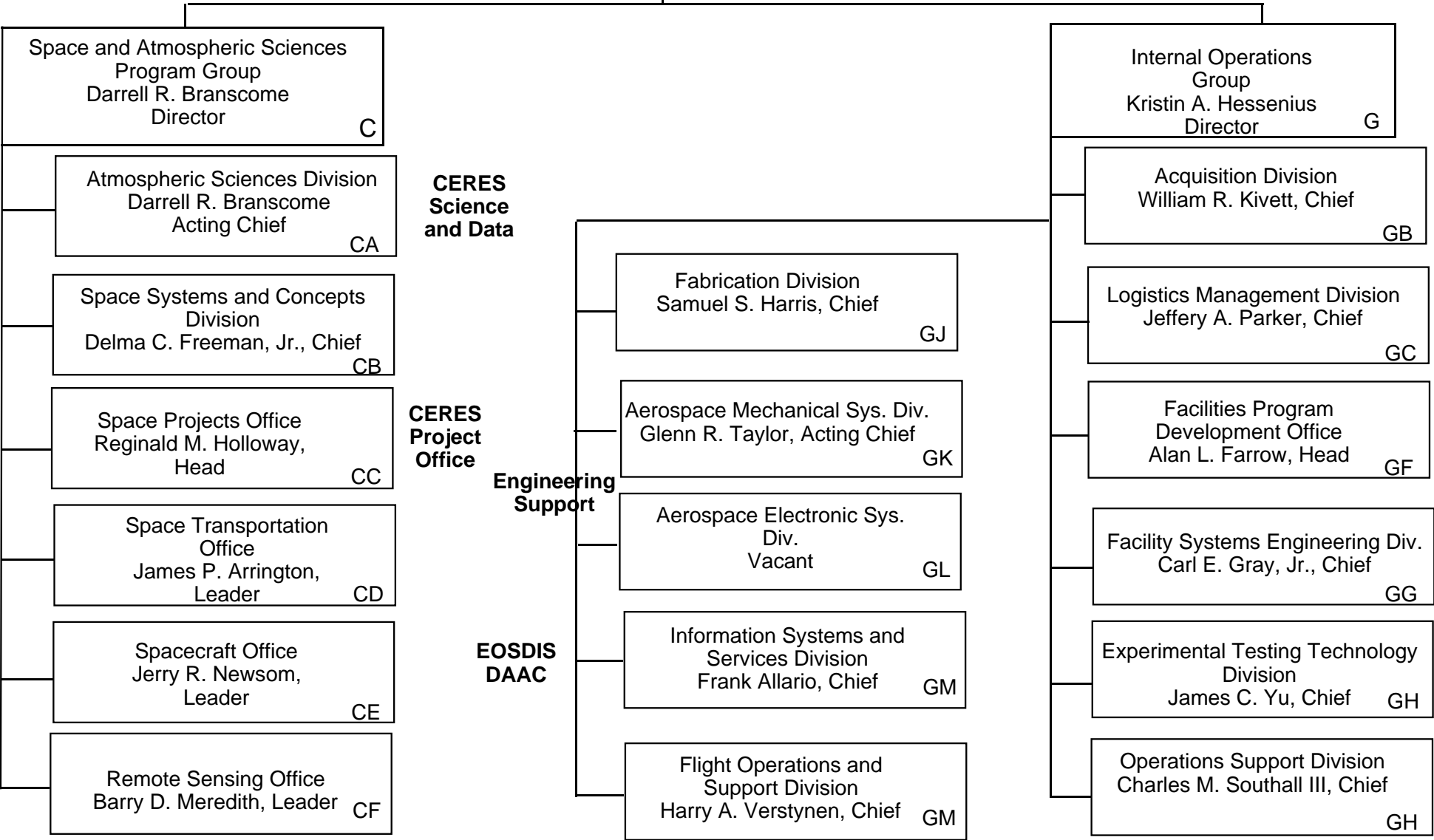
Current Release 2 Issues

Near-term Plans

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Atmospheric Sciences Division
Langley Research Center

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Research and Engineering
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Planning A

Part of
LANGLEY RESEARCH CENTER
Organization Chart
October 1995



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B. A. Childers	44620
P. K. Costulis	41943
J. C. Currey	44691
M. T. Ferebee	45617
E. B. Geier	41854
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**ERBE /SAGE II Mission
CERES Data Management**

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V. S. Connors	45849
E. Conway	41435
R. J. DeYoung	41472
W. B. Grant	45846
N. S. Higdon	45367
S. Ismail	42719
A. M. Larar	45328
J. R. Olson	45327
J. H. Park	45811
C. P. Rinsland	42699
M. A. H. Smith	42701
H. A. Wallio	45366

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G. D. Considine	45805
L. E. Deaver	45696
R. S. Eckman	45822
M. M. Kleb	45816
J. S. Levine	45692
M. G. Mlynczak	45695
R. B. Pierce	45817
E. E. Remsberg	45823
R. E. Turner	45821
J. G. Wells, Jr.	41859

HALOE

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W. P. Chu	42675
G. L. Maddrea, Jr.	42674
L. W. Thomason	46842
Lelia Vann	49356
D. M. Winker	46747
D. C. Woods	42672
O. Youngbluth, Jr.	45332
G. K. Yue	42678
J. M. Zawodny	42681

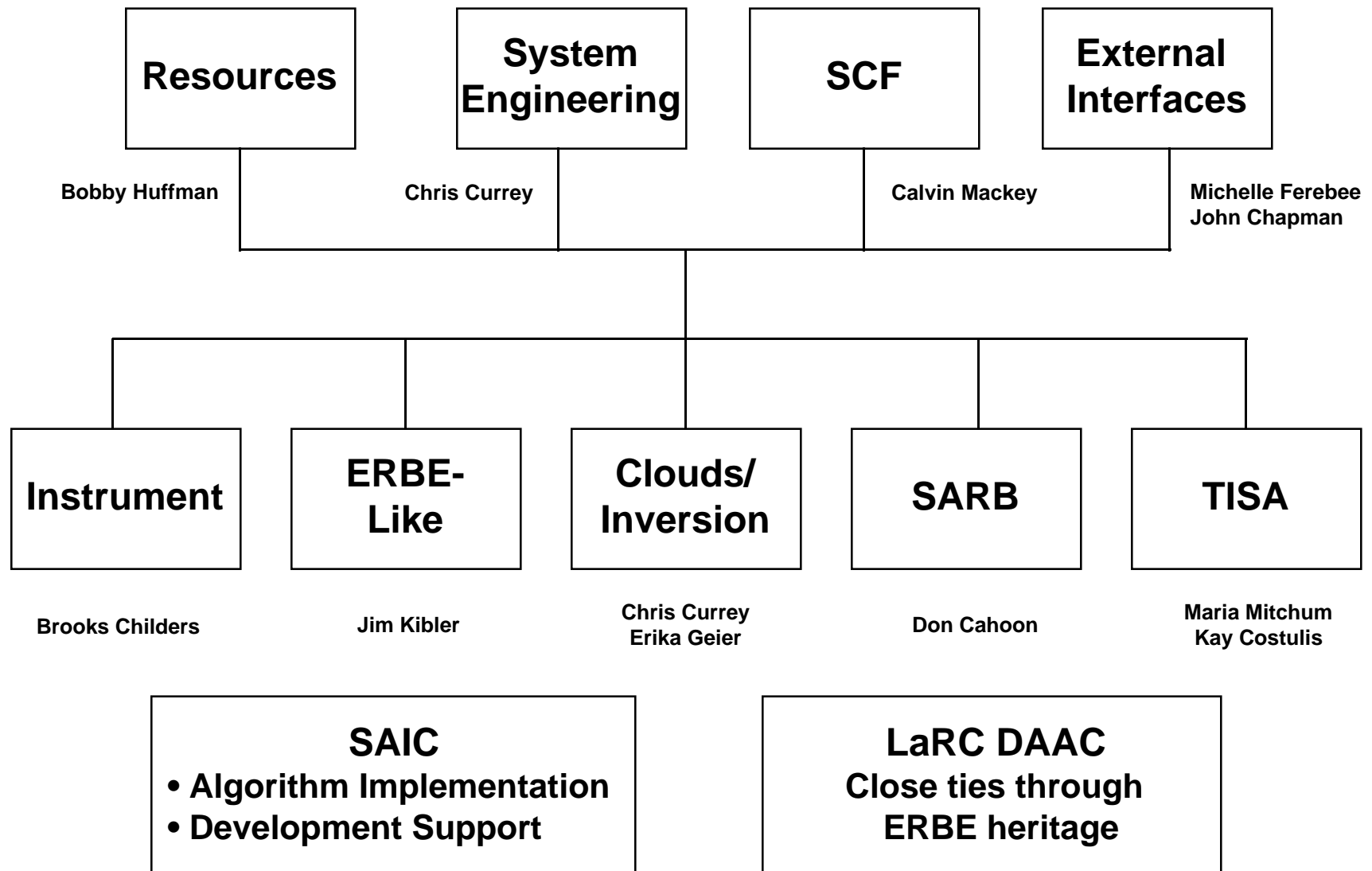
SAGE III

RADIATION SCIENCES BR. 45665, M/S 420 CAF FAX: 47996	
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J. M. Hubble, Sec.	48333
S. German	45664
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B. A. Baum	45670
T. C. Bess	45686
L. H. Chambers	44371
T. P. Charlock	45687
R. N. Green	45684
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R. B. Lee III	45679
P. Minnis	45671
G. L. Schuster	41486
G. L. Smith	45678
C. H. Whitlock	45675
T. Wong	45607

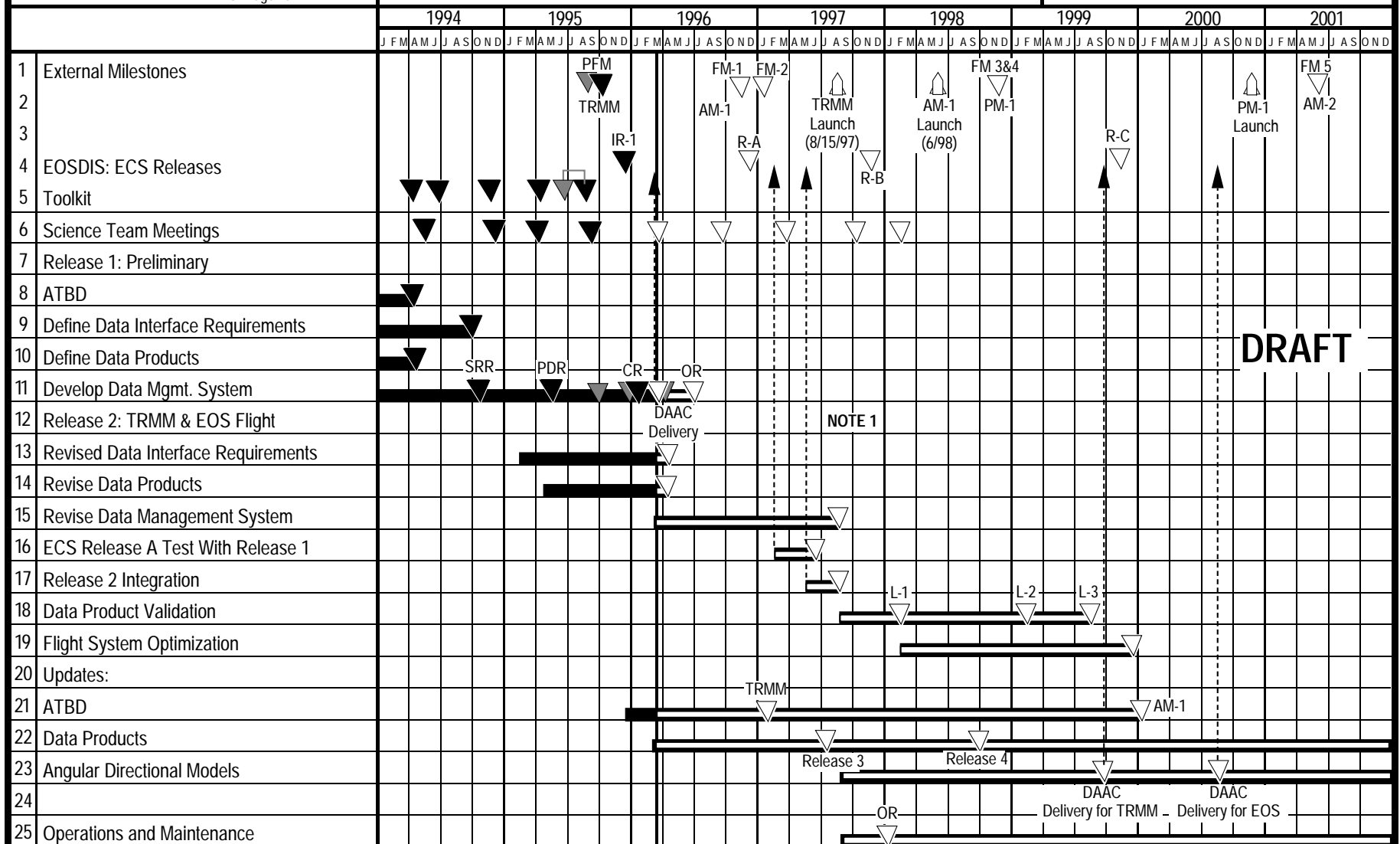
CERES Science

ATMOSPHERIC STUDIES BR 45828, M/S 483 CAG Fax: 45841	
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B. E. Anderson	45850
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G. L. Gregory	45834
D. S. McDougal	45832
G. C. Purgold	45844
J. Raper	48880
J. A. Ritter	45693
A. D. Scott	44430
S. Vay	41574
H. A. Wallio	45366

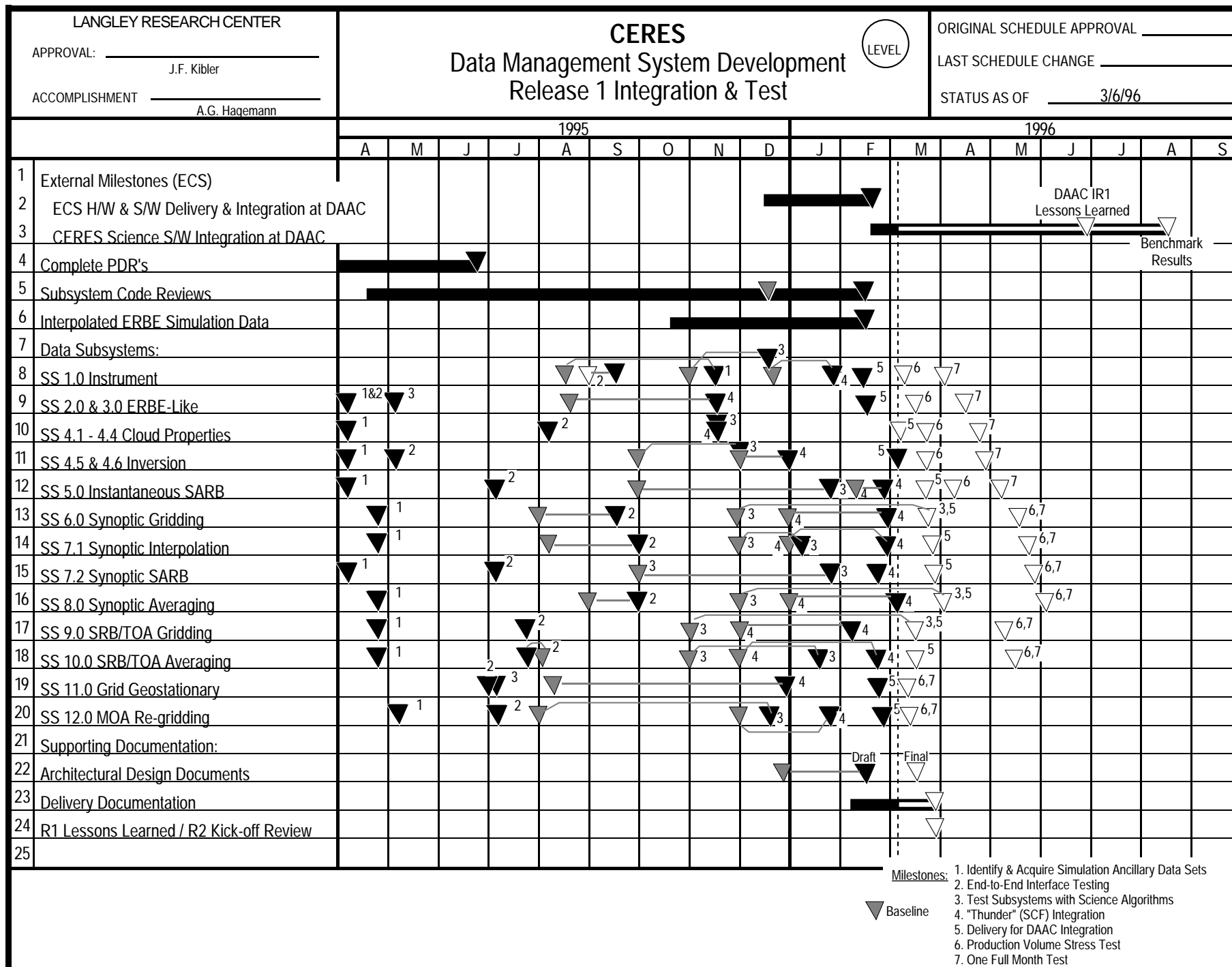
CERES Data Management System Functions



LEVEL

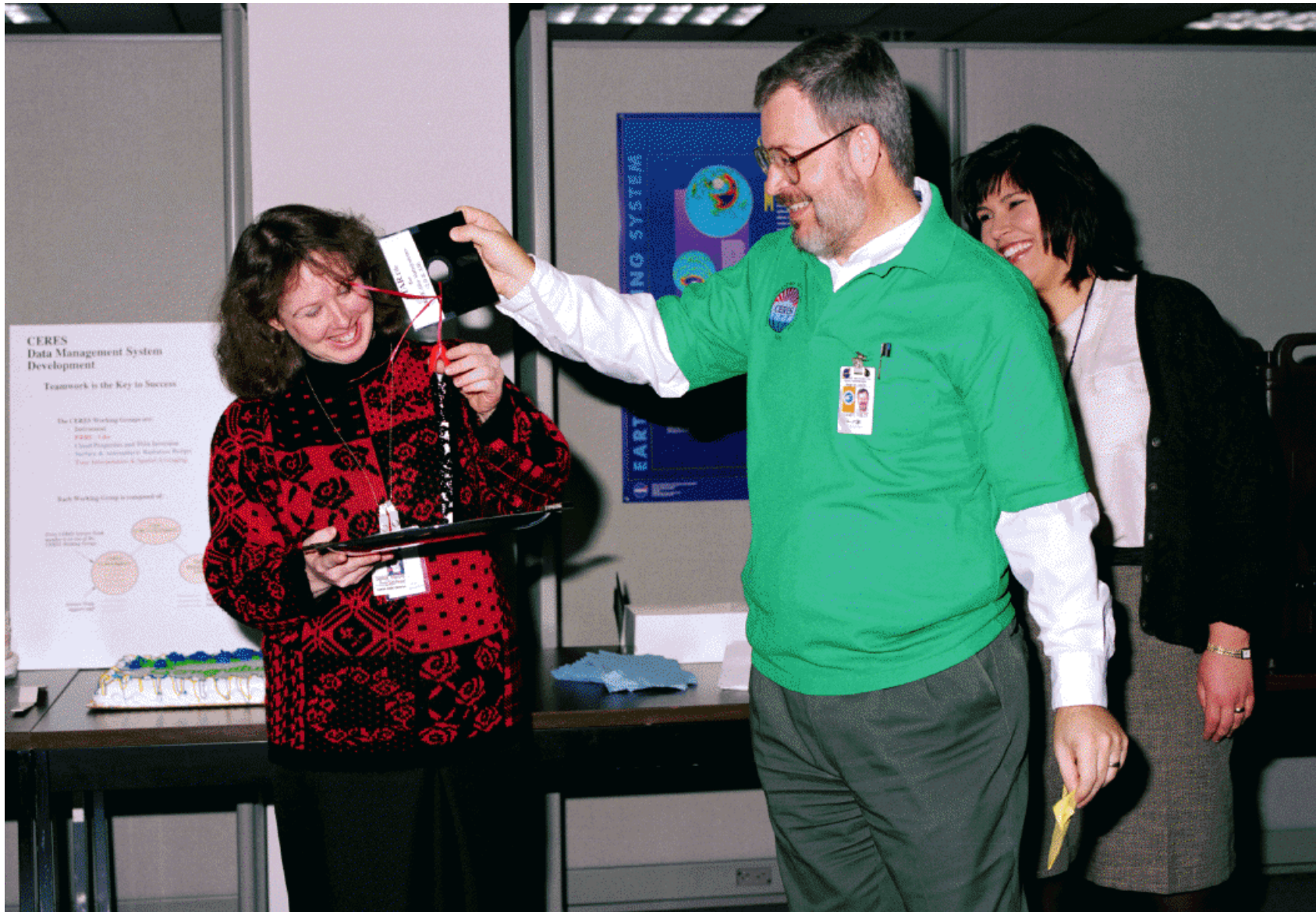
STATUS AS OF 3/6/96

OR: Operations Reviews
SRR: Software Requirements Reviews
PDR: Preliminary Design Reviews
L - # : Level 1, 2, & 3 Data Products





First formal delivery of CERES Release 1 software to Langley DAAC, on schedule - 2/15/96



“Tar File” delivered on a silver platter

Science Software Development and Testing

Requirements - Specify what we have to build

- **ATBD's - Define science algorithm theoretical basis**
- **Data Product Catalog - Content of each archival and intermediate data product**
- **SRD's - Software Requirements Document - More specifics on input/process/output**

Design/Implementation - Example products:

- **Data flow diagrams - describe relationships between major processes and data products**
- **Context diagrams - specify control flow and data flow interactions**
- **Structure charts - functional decomposition at successive levels of detail**
- **Code - implements ideas expressed in all of the above**

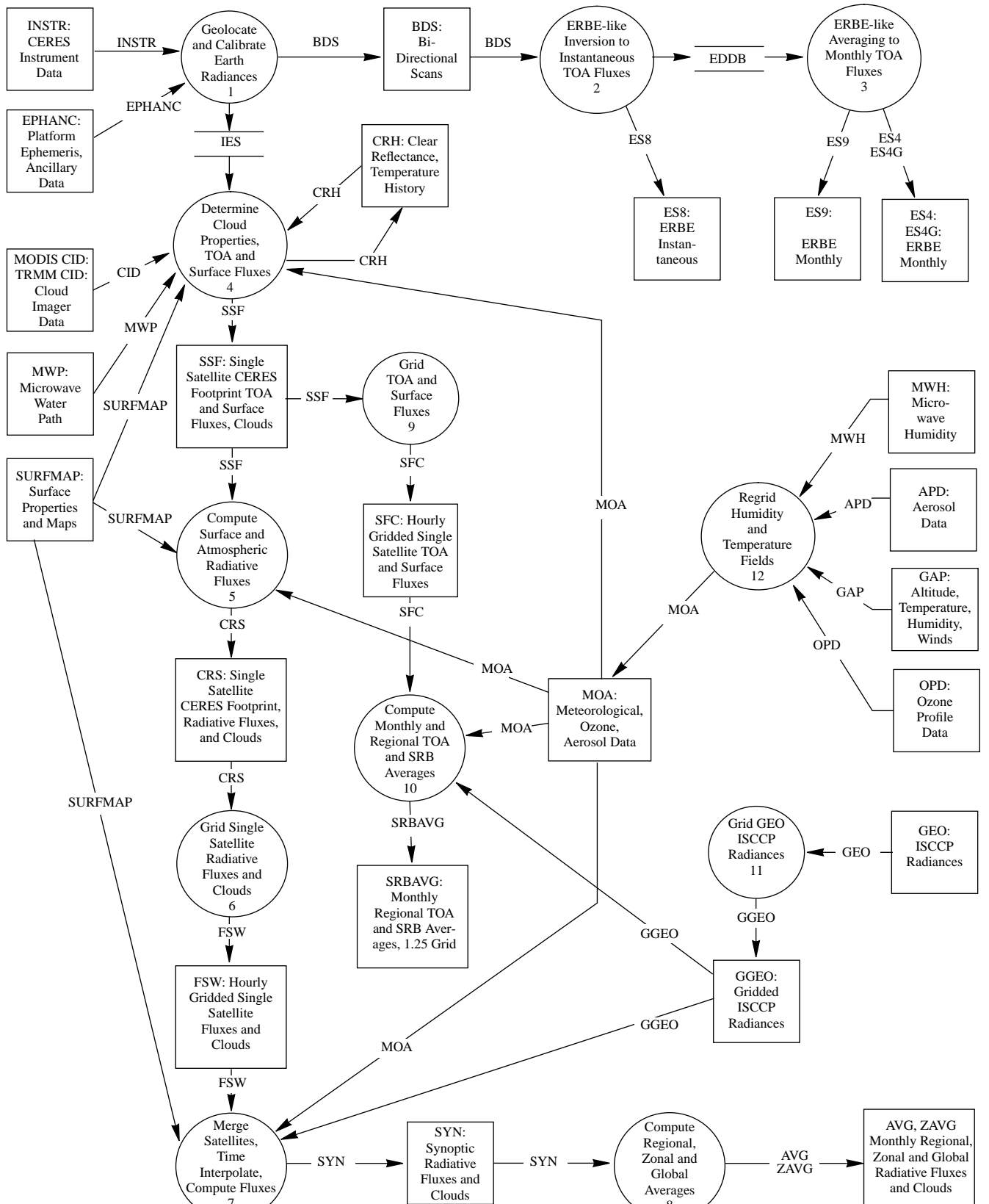
Integration/Testing - Put it together and see if it works

- **Initial development and testing on Sun and SGI workstations**
- **First migration to SCF SGI server set up similar to DAAC environment**
- **Second migration from SCF to DAAC as a formal delivery**
- **Perform production-level stress test and full-month volume test at DAAC**

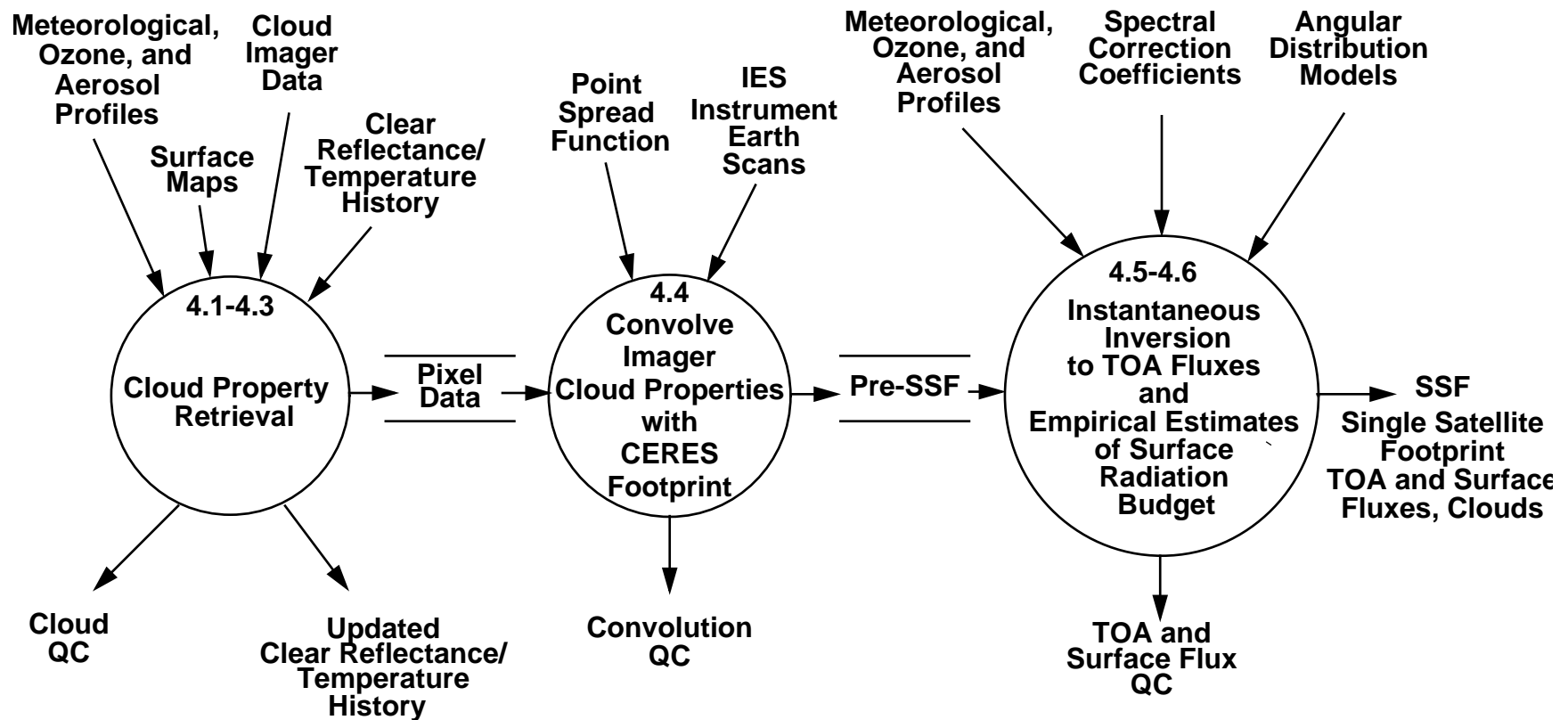
Testing scenario

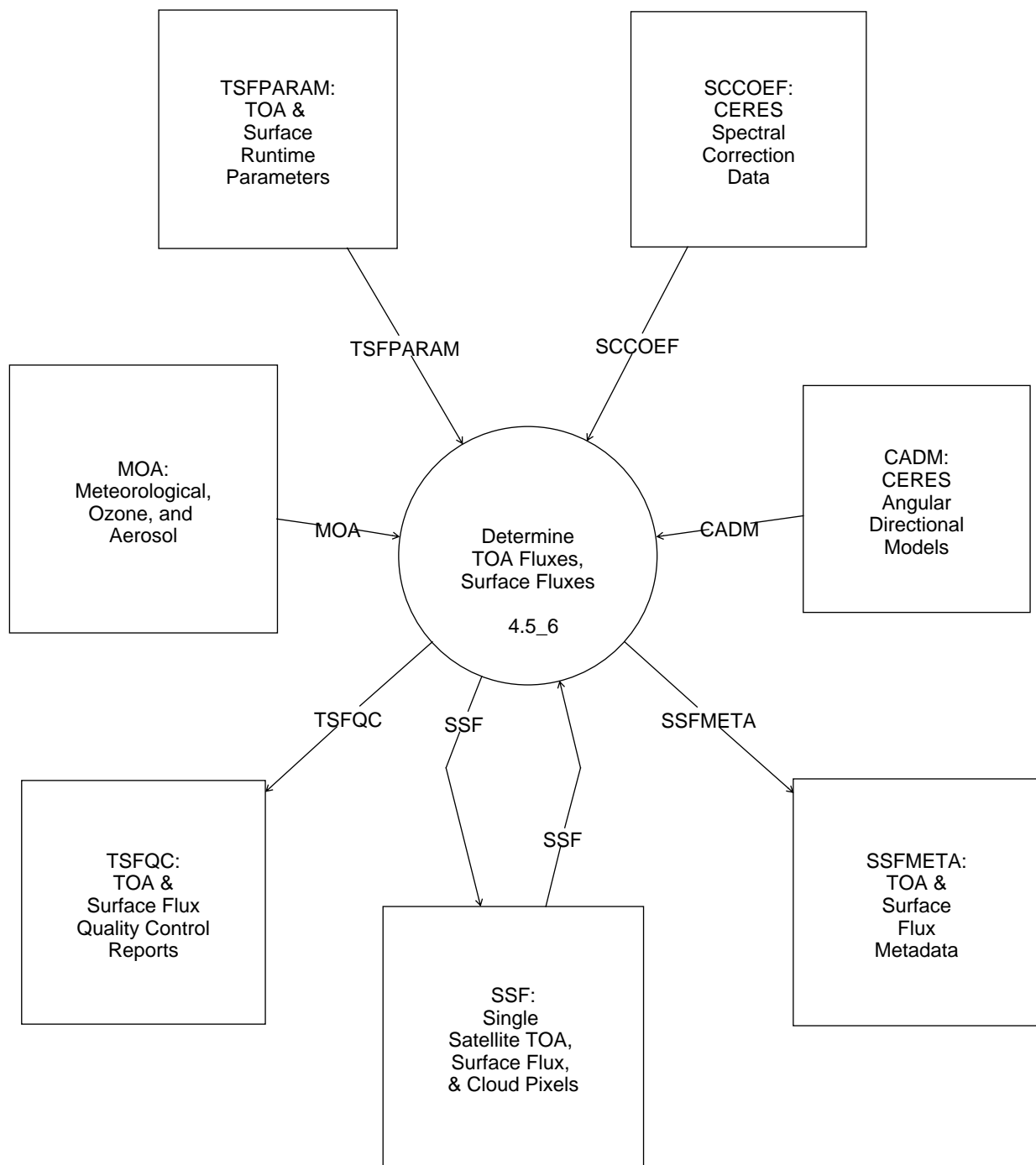
- **Using October, 1986 as the month for focusing test results**
- **ERBE scanner on NOAA 9 simulates CERES data**
- **AVHRR on NOAA 9 simulates TRMM VIRS imager for cloud properties**
- **Simulate ancillary data products from research and production sources:**
 - **ISCCP B3 geostationary vis/IR**
 - **Pinker (U. Md) and Stowe (NOAA) aerosol**
 - **SAGE water vapor/TOMS ozone**
 - **Navy 10 min elevation, land/water, terrain type maps**
 - **NMC gridded temp/humidity**
 - **EPA 10 min ecosystem/surface map**

CERES Top Level Data Flow Diagram



Cloud Subsystem Decomposition





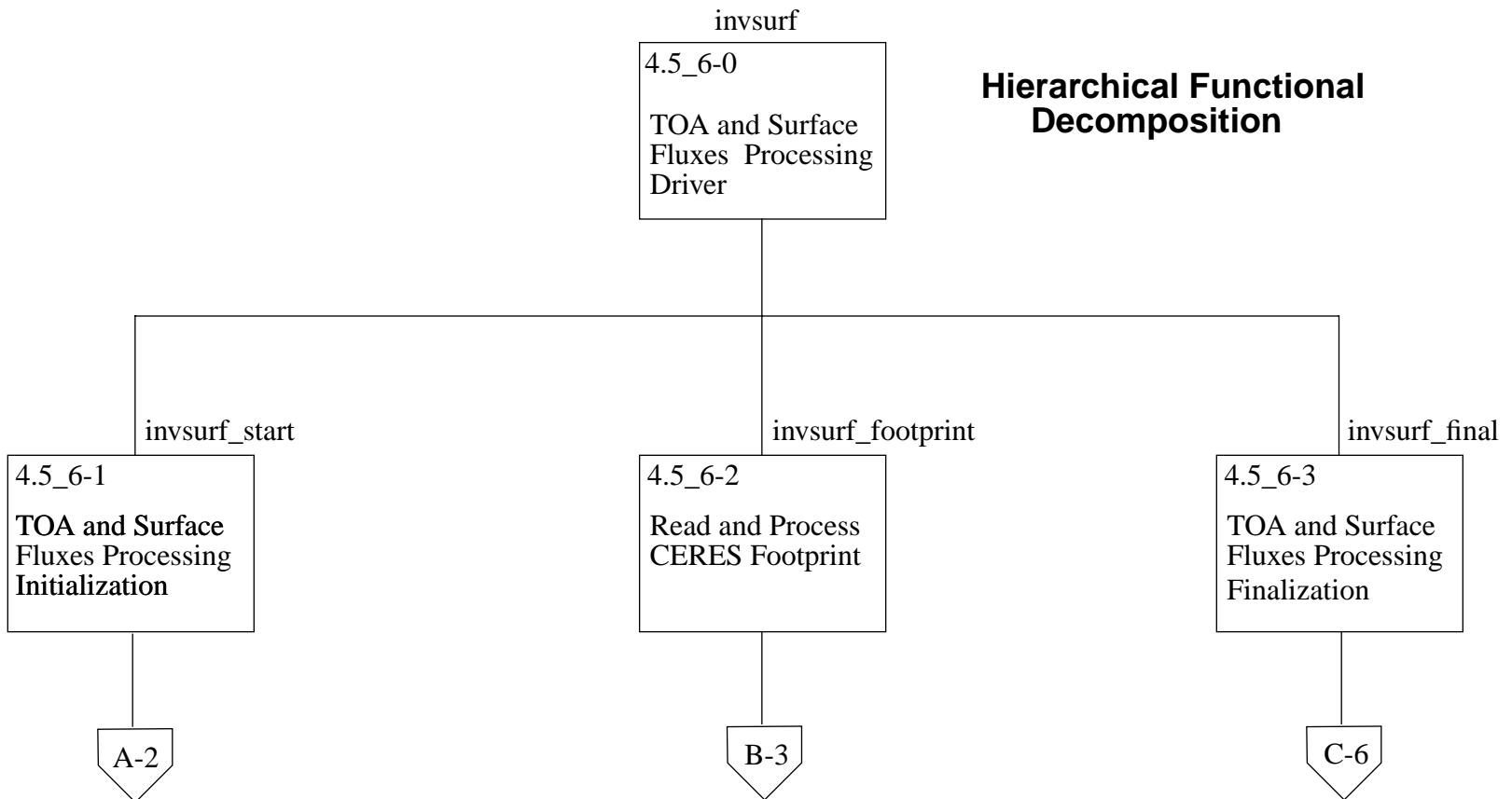


Figure 2-1. CERES TOA and Surface Fluxes Processing Functional Structure Chart (1 of 6)

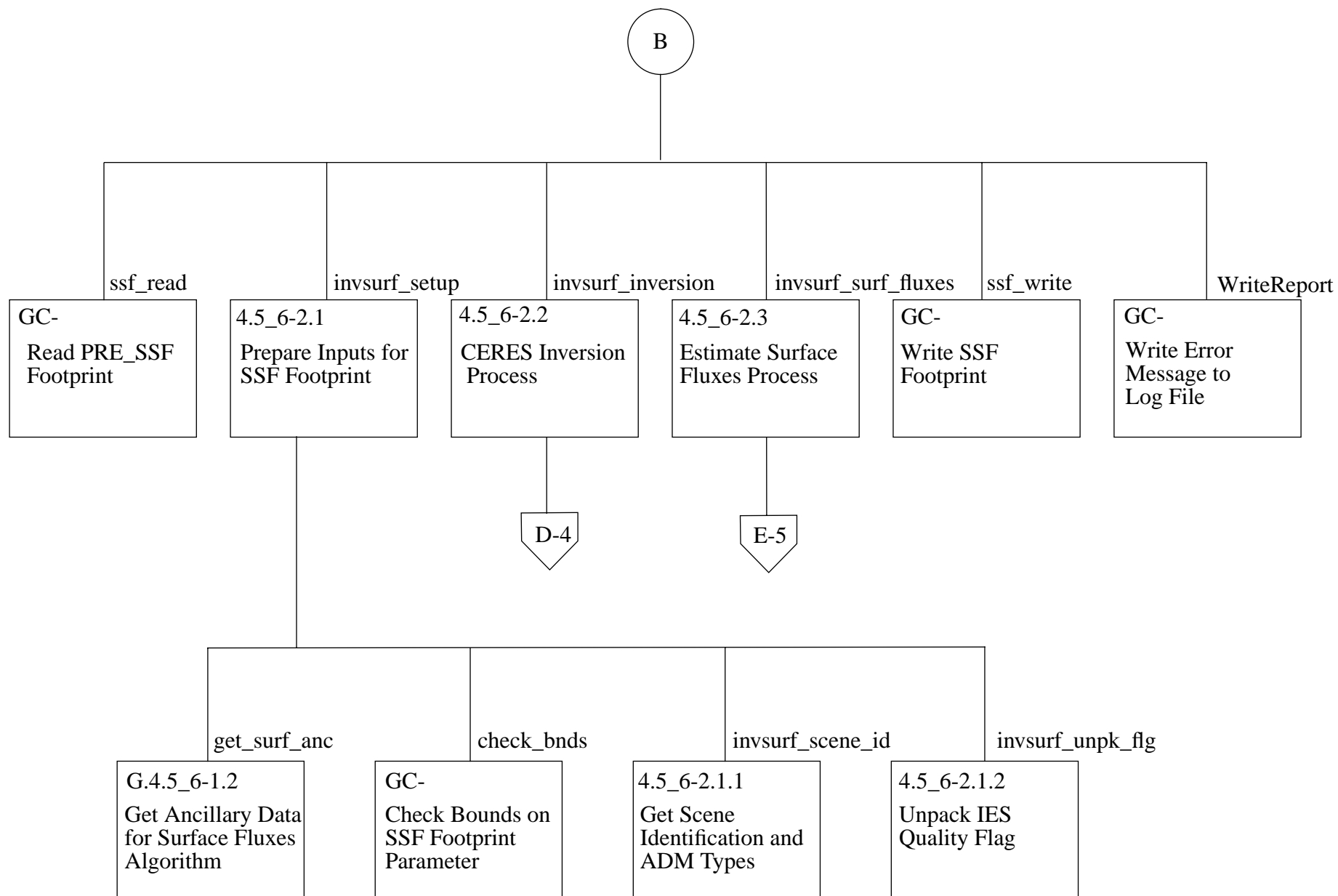


Figure 2-1. CERES TOA and Surface Fluxes Processing Functional Structure Chart (3 of 6)

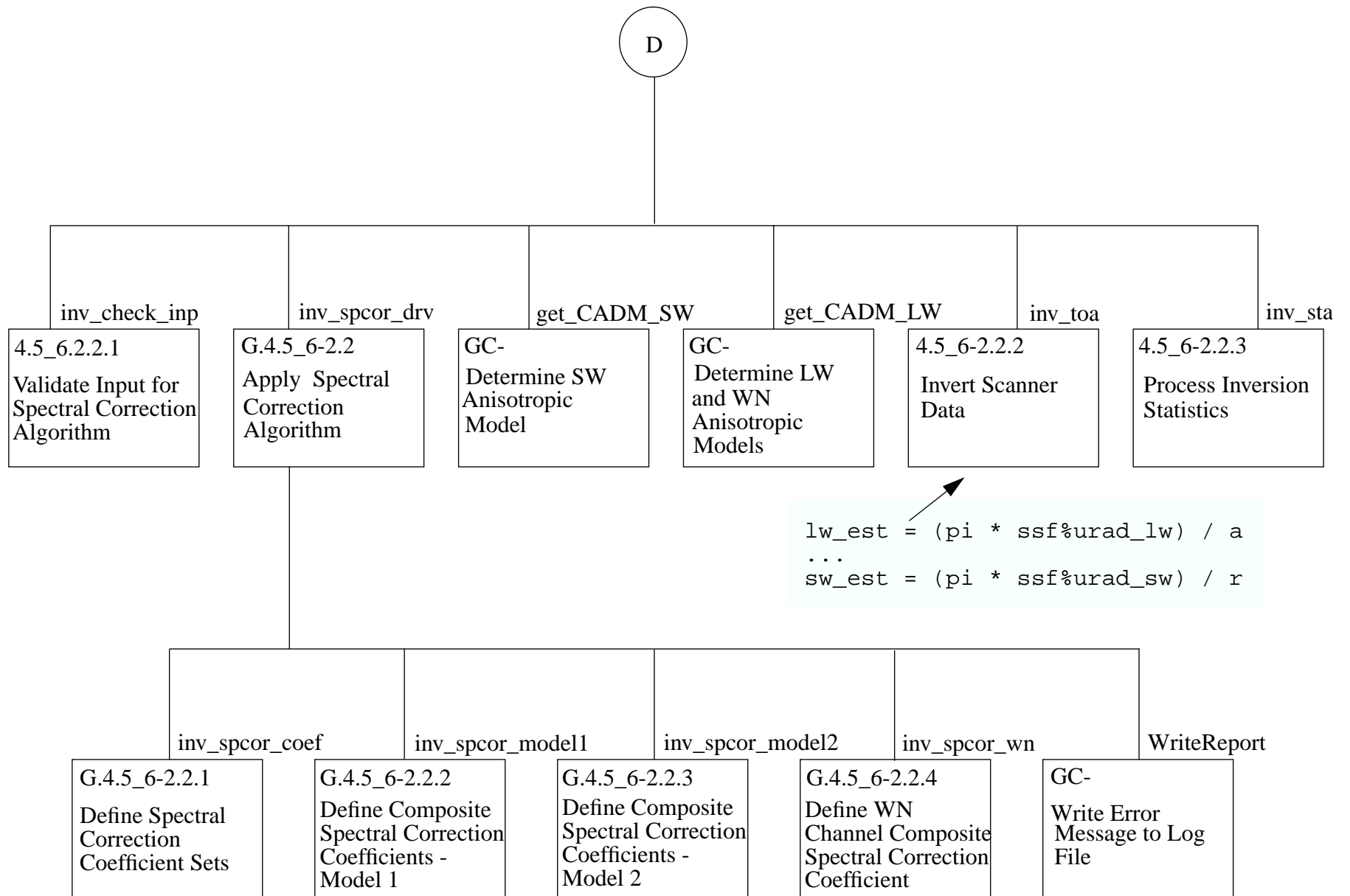
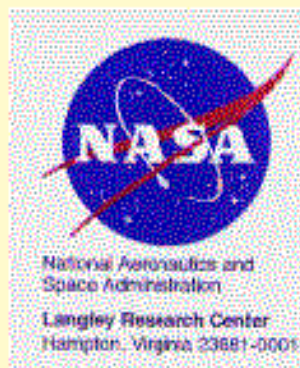


Figure 2-1. CERES TOA and Surface Fluxes Processing Functional Structure Chart (4 of 6)

Location: <http://asd-www.larc.nasa.gov/ceres/docs.html>[What's New](#)[What's Cool](#)[Handbook](#)[Net Search](#)[Net Directory](#)[Newsgroups](#)

CERES On-Line Documentation

- [Algorithm Theoretical Basis Documents](#)
- [Configuration Management Plan](#)
- [Data Management Plan](#)
- [Data Products Catalog](#)
- [Interface Requirements Document](#)
- [Software Coding Guidelines](#)
- [Software Computer Bulletins](#)
- [Software Requirements Documents](#)
- [CERESlib](#)

[ASD Home Page](#)

Last Updated Monday, November 6, 1995, 9:00 EST

Web Curator: P. Kay Costulis (p.k.costulis@larc.nasa.gov)

Development Activities

System Requirements Documents

- **Software specifications derived from ATBD's**
- **Published in 13 volumes on web server**

Preliminary Design Reviews

- **Seven informal working group reviews held from 12/94 - 6/95**
- **Presentations and minutes captured as working documents**

Implementation

- **Coding guidelines published for some measure of consistent common sense**
- **Code walkthroughs of focused modules ongoing since 4/95 and will continue**
- **Computer bulletins (18 so far) to share standard practices, tips, and experiences**
- **CERESlib utilities for common functions across all subsystems**
 - **Includes module to isolate machine dependencies such as word sizes**
 - **Standard access routines for each archival data product (not HDF in Release 1)**

Integration and Testing

- **Set up SCF target environment (Thunder) to model DAAC configuration**
- **Porting from SCF development workstations to Thunder**
- **Close interaction with Science Team to review results every step of the way**

External Interfaces and Mission Operations

Responsible for:

- **Negotiations with GSFC, EOS, and TRMM Projects**
- **Coordination with Langley CERES Project Office and TRW**
- **TRMM & EOS Instrument monitoring, real time displays, instrument health & status**
- **Software to distribute/analyze H/K data from TRMM IST to LaRC workstations**

TRMM:

- **TRMM MOC has agreed to develop software for automatic generation of command loads**
- **Instrument support terminal in place and ready for testing**
- **Method defined to distribute real-time H/K displays to multiple terminals without violating NASCOM security rules - Waiting on ruling for “dual-connection” to NASCOM**
- **Comments on TRMM Flight Operations Plan sent to TRMM FOT**

EOS-AM:

- **Comments on EOS/CERES Operations ICD sent to MMC**

Near-term Plans:

- **Testing of MODNET/NOLAN interface between CERES IST and TRMM MOC**
- **Develop prototype software for analyzing TRMM snap files**
- **Continue to work flight operations details with TRMM and EOS-AM personnel**
- **Participate in EOS AM Instrument Operations Workshop in April at Lockheed-Martin**
- **Continued discussions with TRMM MOC to define automated command load software requirements**

CERES Instrument Simulator

Processor simulation for validation of re-programming and in-flight anomaly investigation

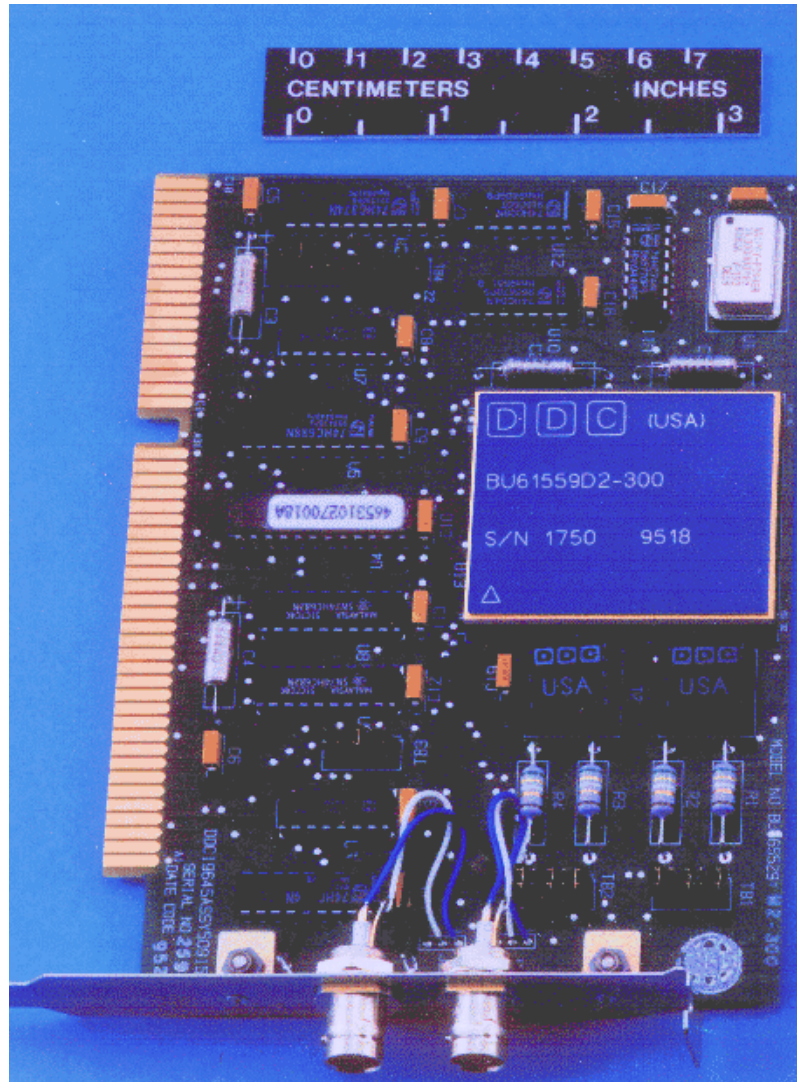
- **CERES / TRW cards being assembled at LaRC Electronics Fabrication shop**
- **SRAM and EPROM memory adapters designed and delivered**
 - **Ready for adaptor fitting and wiring to the ICP, DAP and spacecraft interface cards**
- **TRW / GSE software installed on Pentium 120 MHz**
 - **Housekeeping and science data displays**
 - **Matlab / Simulink graphical outputs**

Current Status:

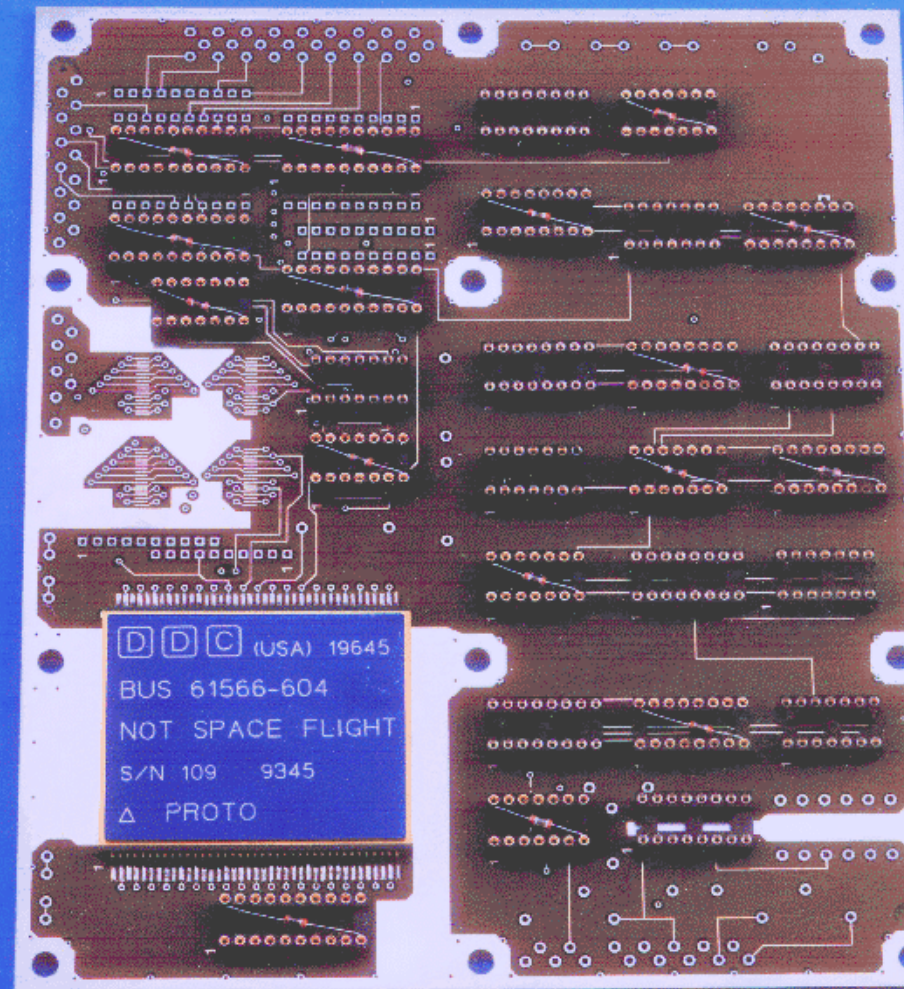
- **TRW flight code downloaded into 27C64 EPROMs and ready for installation**
- **Host-PC software: Card driver being developed to link Matlab / Simulink models**
- **Host-PC cards: I/O card installed for Matlab/Simulink I/O link to CERES processor**
- **TRW circuit cards from Cirtech: Mounting memory adaptors**
- **1553 interface : BCU software being adapted for PC uplink to spacecraft interface card**

Near-term Plans:

- **Upgrade host PC from 486**
- **Use TRW 'as built' photos and drawings to determine jumper and component positions**
- **Interconnect cards with cabling**
- **Package cards and commercial components in enclosure**

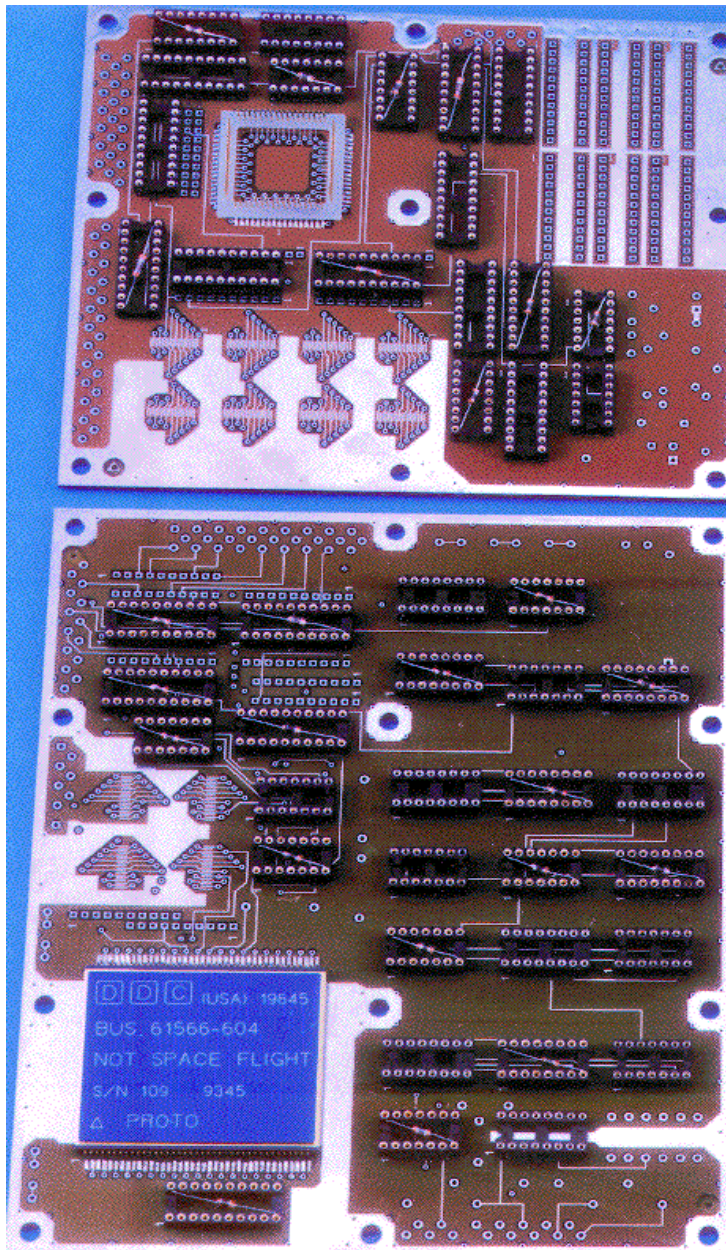


Host PC I/O Card



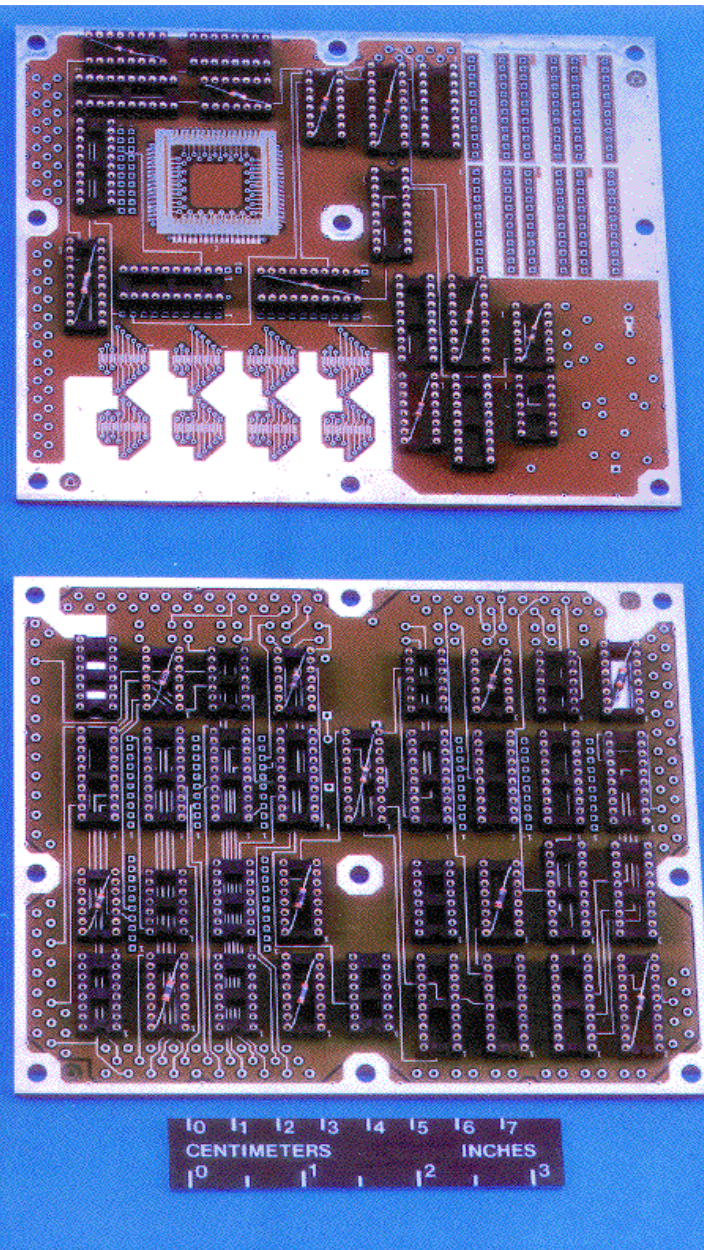
1553 Spacecraft I/O Interface

Instrument Control Processor



From/to Spacecraft

Data Acquisition Processor



To/from Instrument Mechanicals

Working Group: Instrument

Responsible for:

- **Subsystem 1 (Instrument Geolocate and Calibrate Earth Radiances)**

Data Products:

- **BDS (Bi-Directional Scan)**
- **IES (Instrument Earth Scan)**

Current Status:

- **Release 1 delivered to the LaRC DACC 2/15**
- **Completing Release 1 functionality necessary for production test**
- **Incorporating CERES simulated data into a Level 0 file for testing subsystem**

Near-term Plans:

- **Evaluating Release 1 lessons learned**

Simulated CERES Data

Objective:

- **Develop technique to simulate CERES L0 and L1 data based on ERBE data from NOAA/ERBS**

Technique Developed:

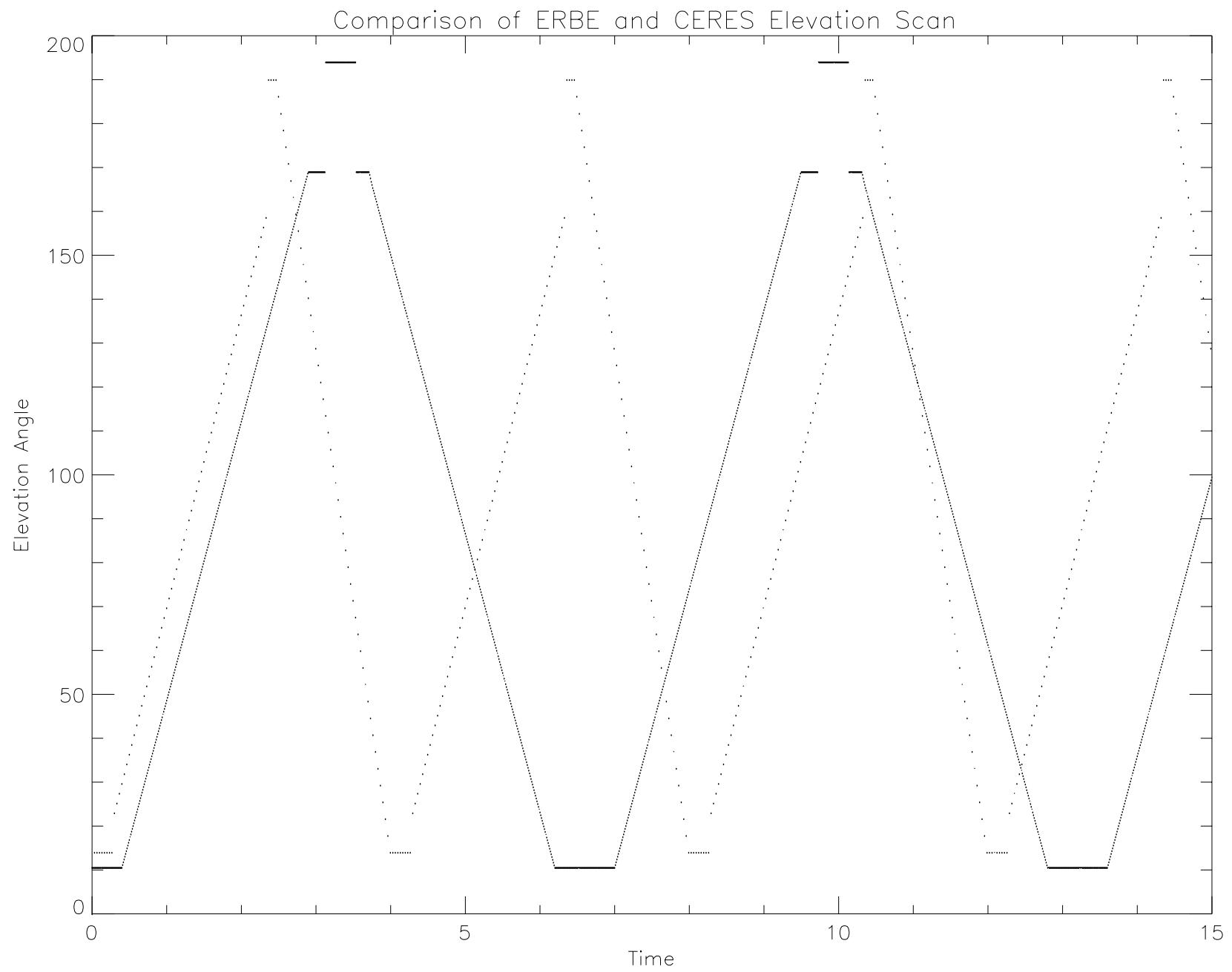
- **Use PGS Toolkit with appropriate NOAA or ERBS orbit data and CERES scan profile to compute FOV geolocations**
- **Interpolate ERBE radiances in scan angle and time to produce CERES radiances**
- **Use PGS Toolkit to calculate spacecraft-Sun-FOV geometry**

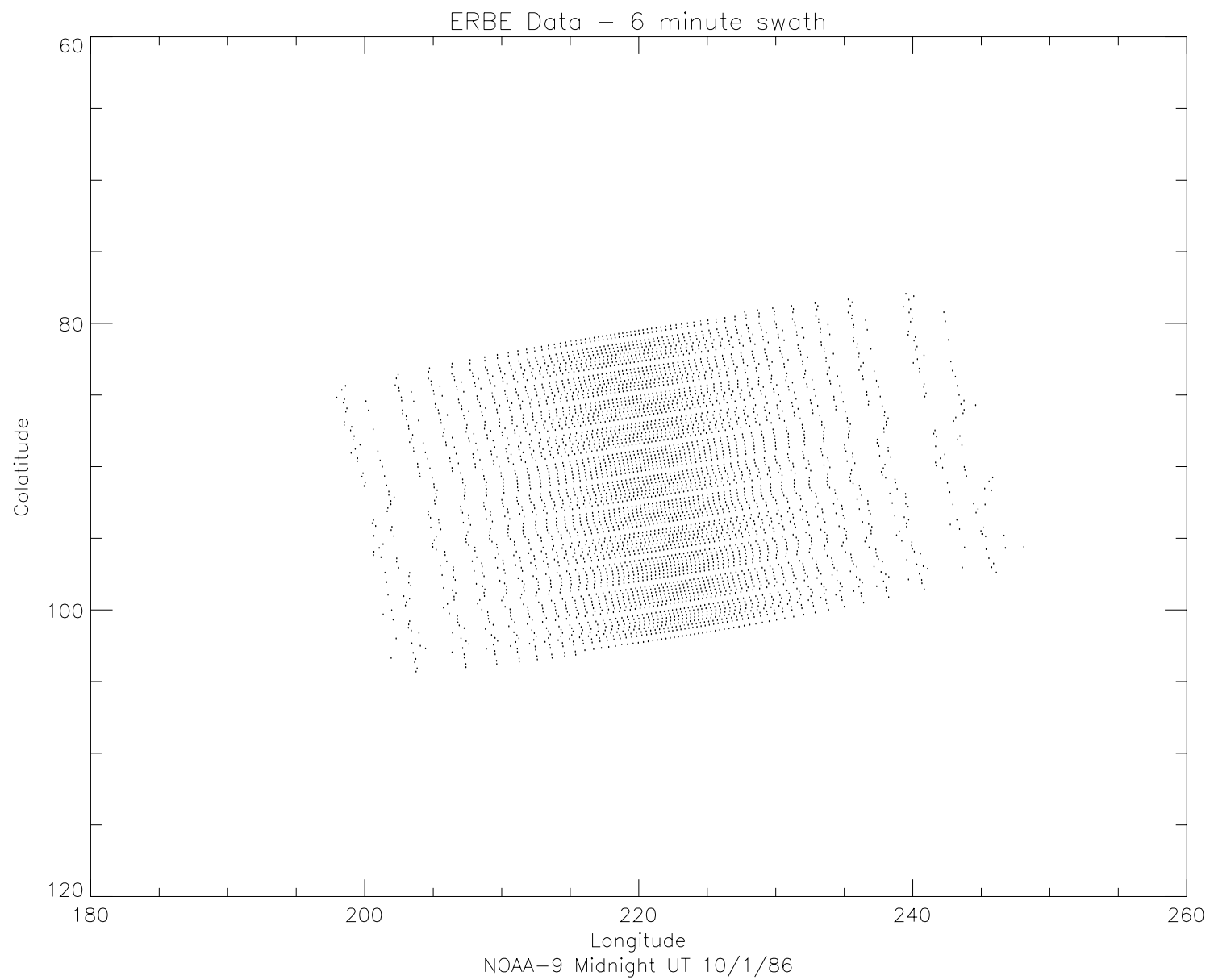
Current Status:

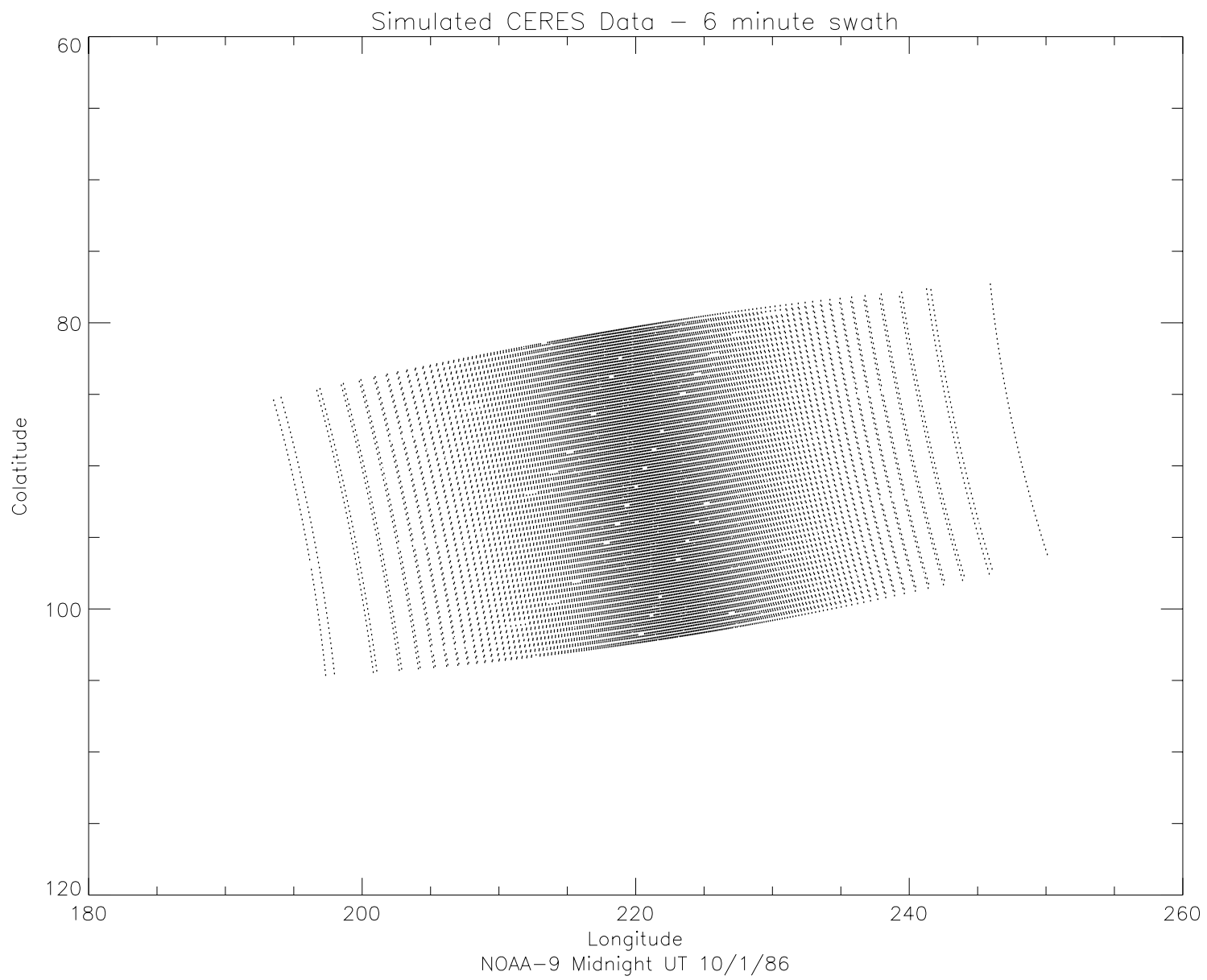
- **Produced CERES L0 and L1 data based on NOAA-9 mission for 10/1/86**
- **Produced one hour ERBE-Like input file - successfully processed by ERBE-Like subsystem**

Near-term Plans:

- **Produce one month of L0, ERBE-Like, and Clouds subsystem inputs for production tests**

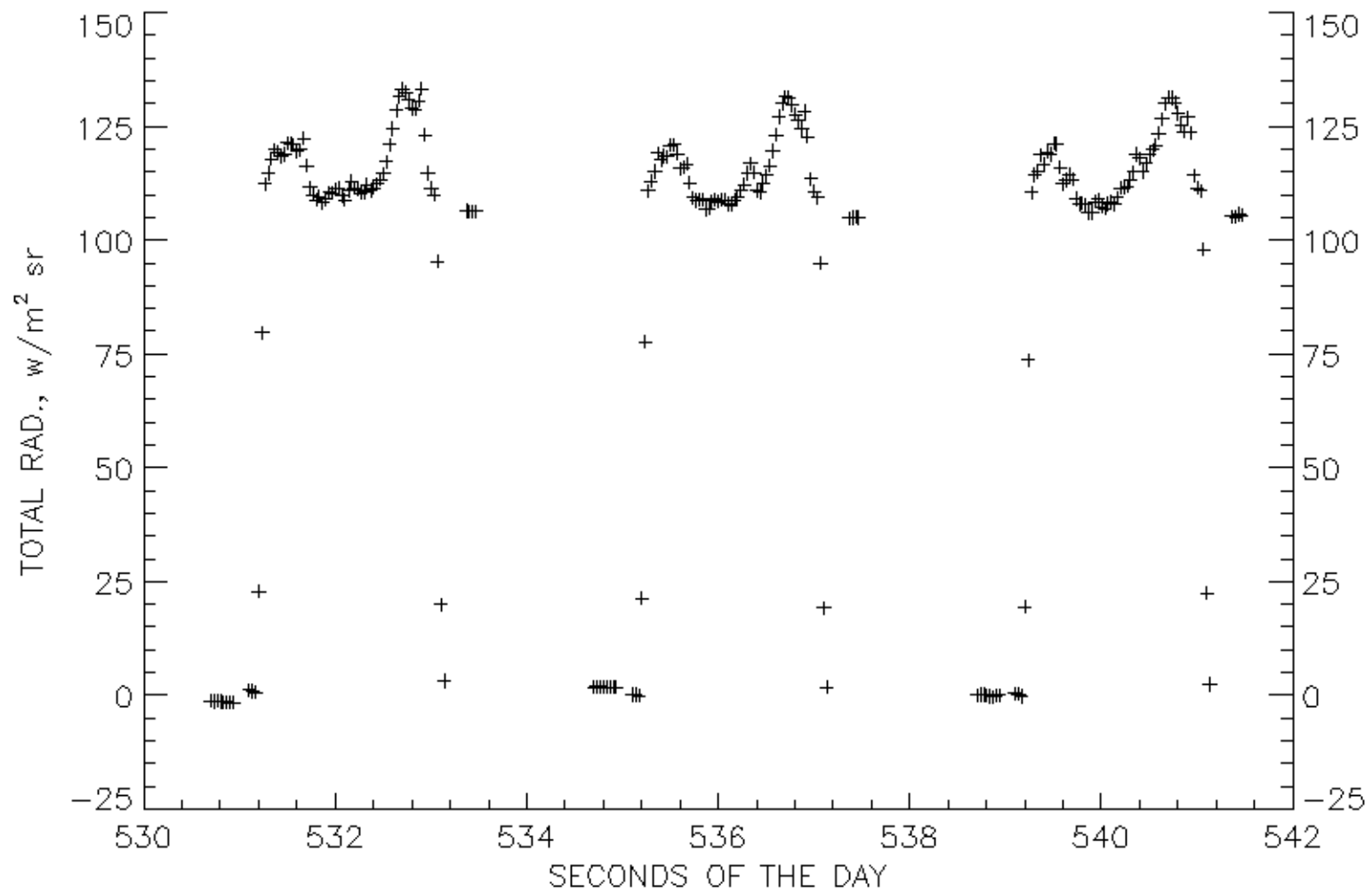






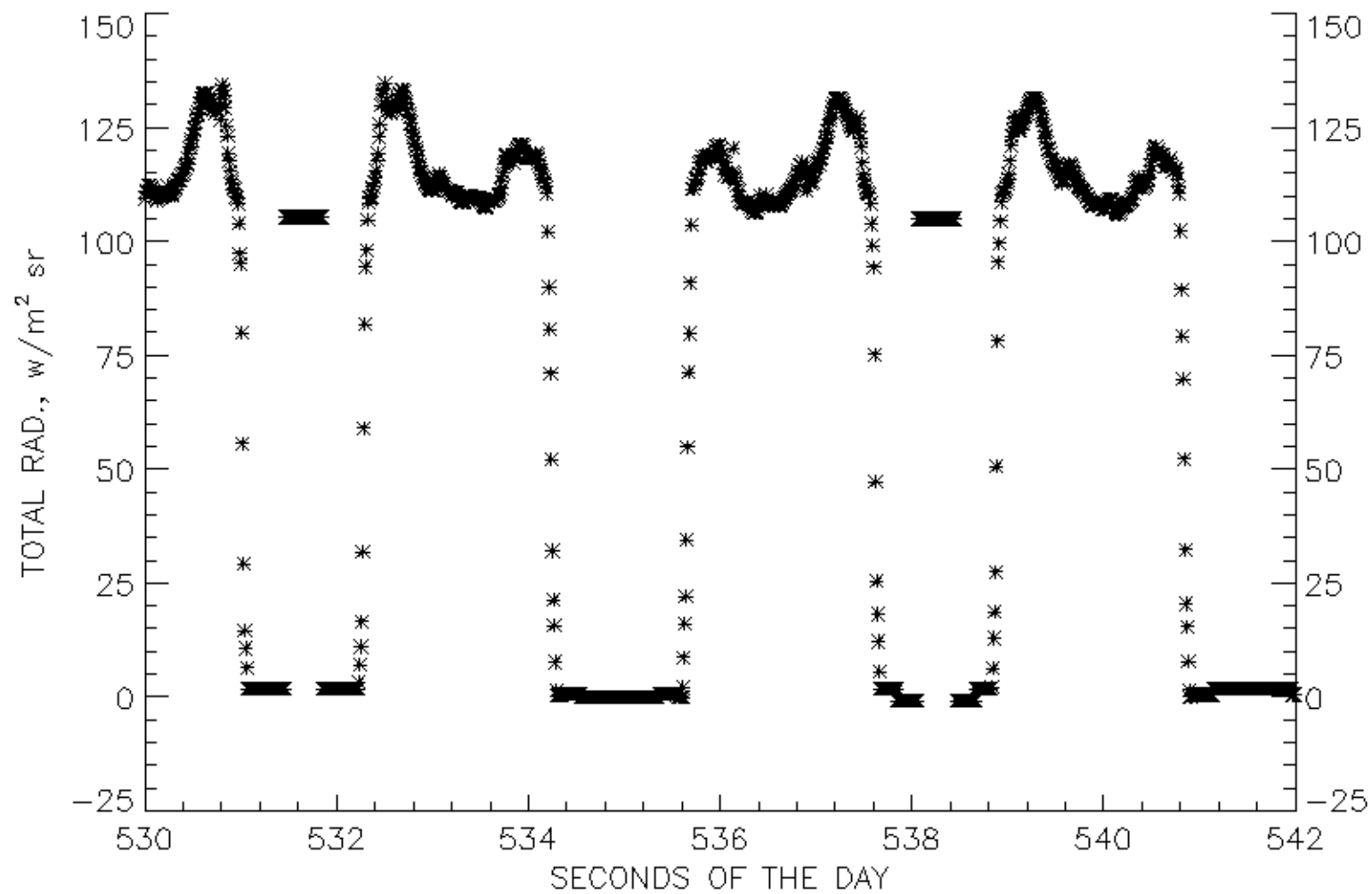
ERBE Scanner Measurements

NOAA-9 861001 (ERBE)



ERBE Interpolated to CERES Characteristics

NOAA-9 861001 (CERES)



Working Group: ERBE-Like

Responsible for:

- **Subsystem 2 (ERBE-like Inversion to Instantaneous TOA Fluxes)**
- **Subsystem 3 (ERBE-like Averaging to Monthly TOA Fluxes)**

Data Products:

- **ES-8 (Equivalent to ERBE Instantaneous TOA Estimates)**
- **ES-9 (Monthly Averaged Regional Parameters)**
- **ES-4, ES-4G (Monthly Averaged Regional, Zonal, Global Parameters by region and gridded)**
- **Scene ID Ancillary Input Data, Spectral Correction Ancillary Input Data**
- **Solar Declination values for each year, Albedo Directional Model values**

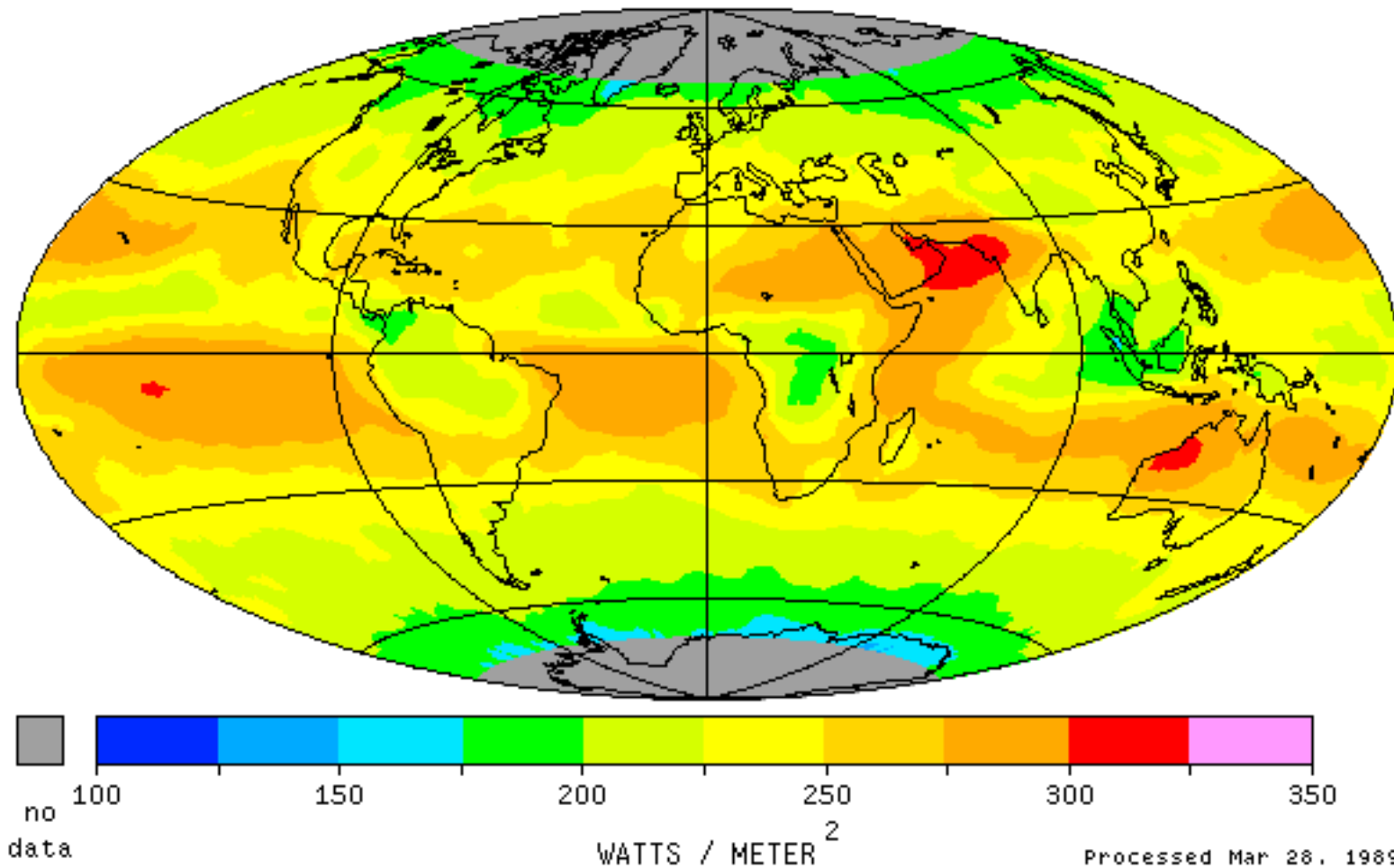
Current Status:

- **Release 1 Software, supporting data files, and Test Plan were delivered to DAAC (2/15/96).**

Near-term Plans:

- **Prepare ERBE-like Reference Manual.**
- **Continue to support new ERBE ADM testing.**
- **Continue to support analysis of NOAA-9 and NOAA-10 calibration problems.**

LONGWAVE RADIATION
ERBS, 2.5 DEG SCANNER
OCTOBER 1986



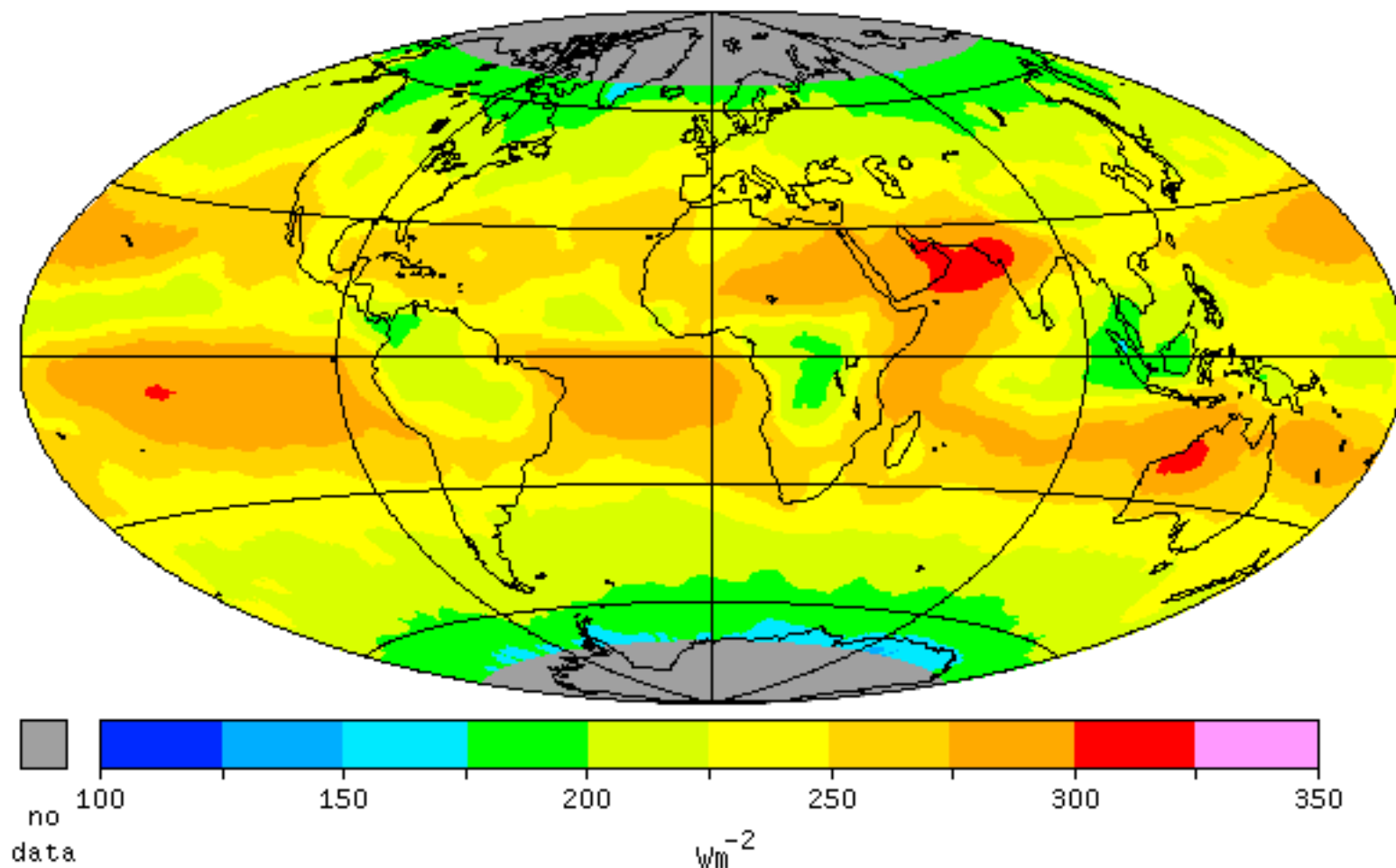
Longwave Radiation from CERES ERBE-Like Processing

ERBS October 1986

ProcDate: Mar 1 1996

2.5 Deg Region Scanner

Monthly Mean (Hour)



Working Group: Clouds

Responsible for:

- **Subsystem 4.1 - 4.3 (Clear/Cloud Detection, Cloud Layers, Optical Properties)**
- **Subsystem 4.4 (Convolution with CERES Footprint)**

Data Products:

- **SURFMAP (Surface Map and Properties)**
- **VIRS & MODIS & AVHRR (Cloud Imager Data)**
- **CRH (Clear Reflectance/Temperature History)**
- **CookieDough, CloudVis, CV_Subset, FOOTPRINTVal**
- **Intermediate SSF (Single Satellite Footprint - Cloud Properties)**

Current Status:

- **F90 Production code running on SCF SGI in 32 bit mode, Irix 6.1**
- **All Release 1 Science Algorithms Integrated:**

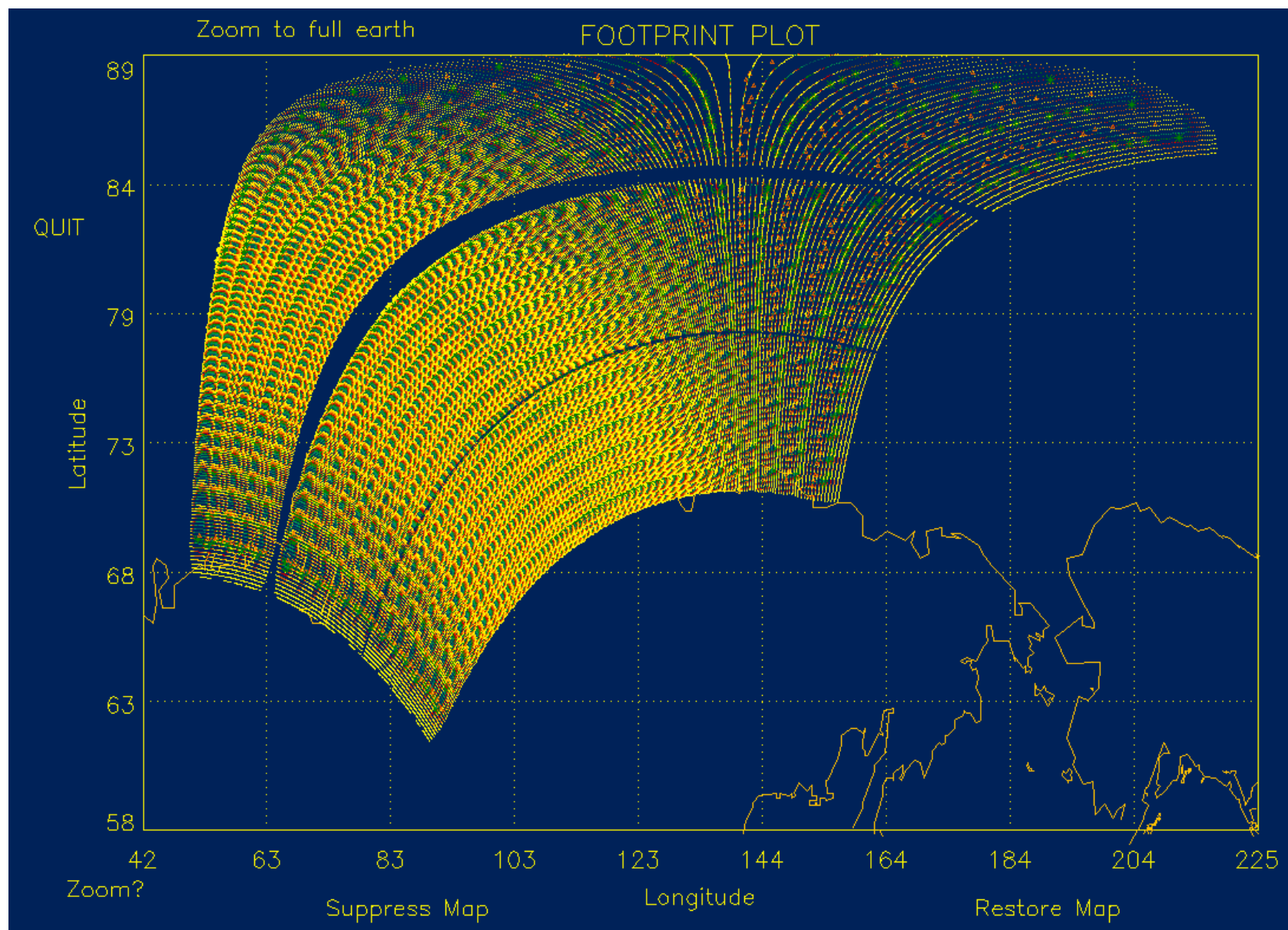
CERES cloud mask - Welch, Baum
AI cloud classification - Baum
Cloud layers - Coakley

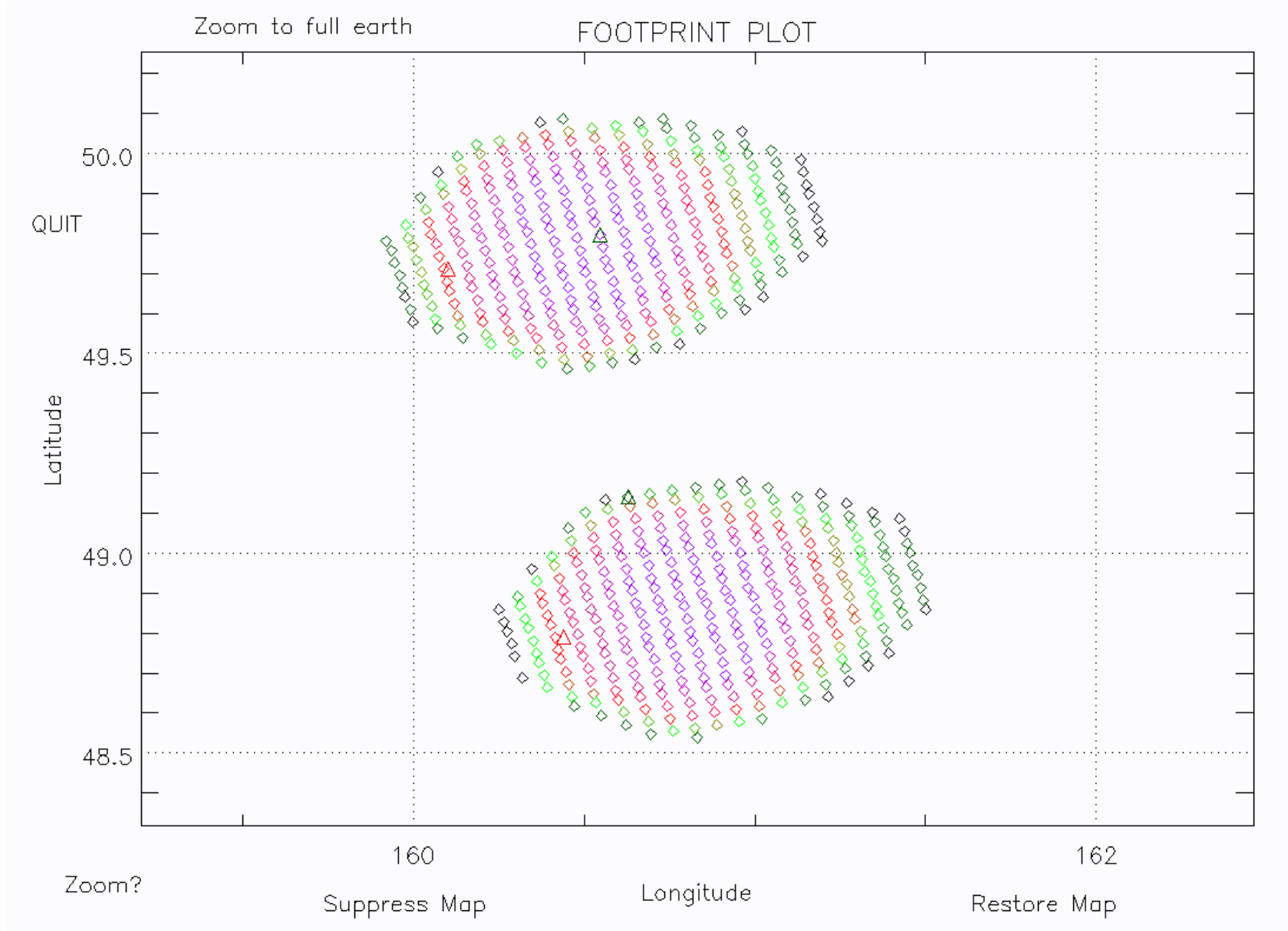
Aerosol optical depth - Stowe
Water droplet cloud properties - Platnick
Microphysical and optical properties - Minnis
Surface properties - Rutan

- **Producing hourly data products for first 15 days of October 1986**

Near-term Plans:

- **DAAC delivery on March 7, 1996 includes Tar files and Test Plan**
- **Support NASA Pathfinder Program - Global layered cloud systems**
- **Prepare Release 1 lessons learned and prepare for Release 2**





Working Group: Inversion and Surface Estimation

Responsible for:

- **Subsystem 4.5 (CERES Inversion to Instantaneous TOA Fluxes)**
- **Subsystem 4.6 (Estimate Longwave and Shortwave Surface Radiation Budget)**

Data Product:

- **Archival SSF (Single Satellite Footprint, TOA and Surface Flux, Clouds)**

Current Status:

- **Release 1 software testing complete on SGI**
- **Architectural Design Document Draft for Release 1 complete**
- **Release 1 Test Plan complete**
- **Release 1 software uses toolkit but SSF not written in HDF**

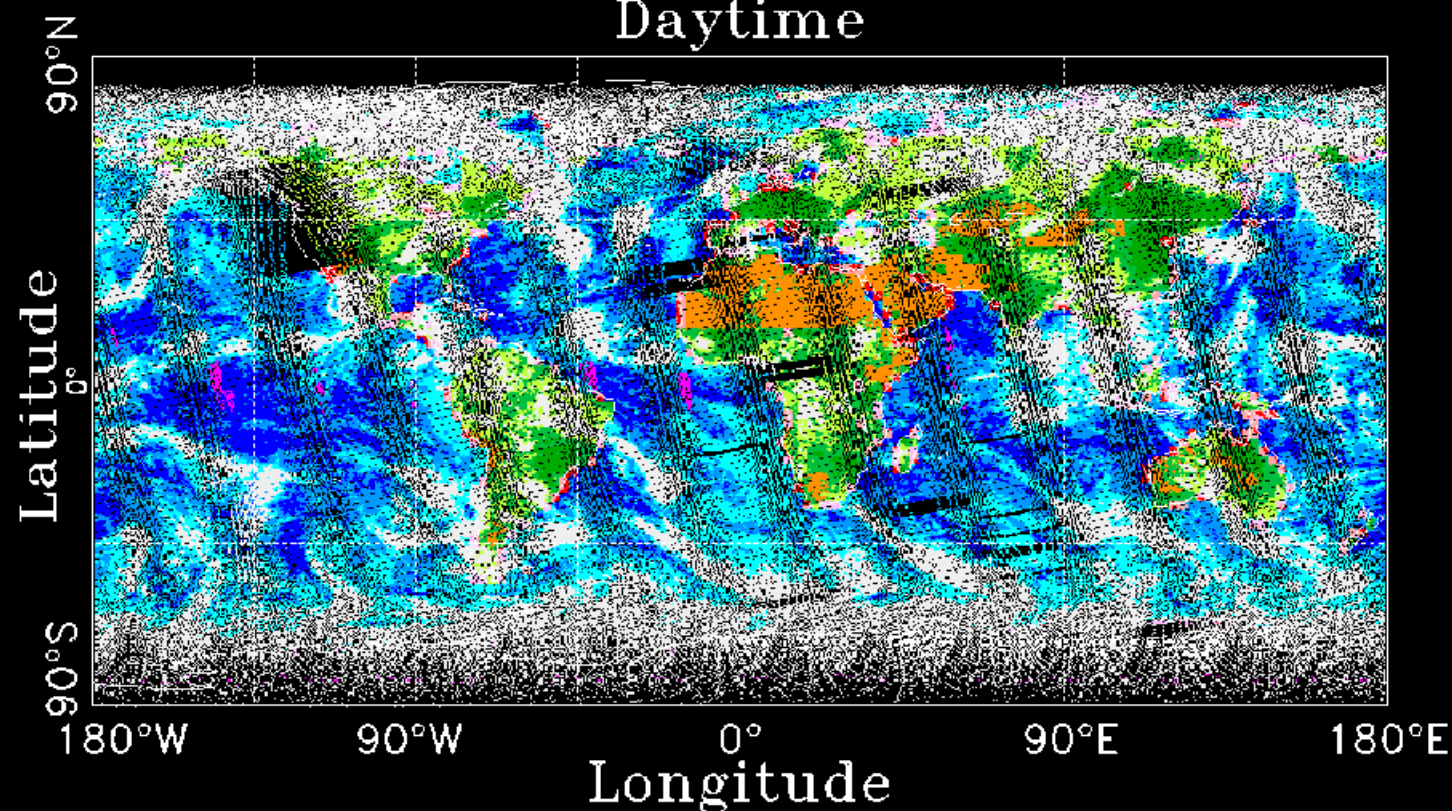
Near-term Plans:

- **Release 1 software to be sent to DAAC on March 7, 1996**
- **Finish up activities related to Release 1**
- **Examine and begin redefining SSF data product based on current and projected needs**
- **Begin obtaining and implementing QC report requirements**

S8 ERBE Plot geier Fri Mar 1 13:42:58 1996
 Date Processed: 07/10/88
 Satellite: NOAA 9
 Orbits: 9274- 9288

Data Start: 10/01/86
 00:00:06
 Data End: 10/01/86
 23:59:34

Scanner, Scene I.D. Daytime



CERES SSF Plot geier Thu Mar 7 09:41:40 1996

Process Date:

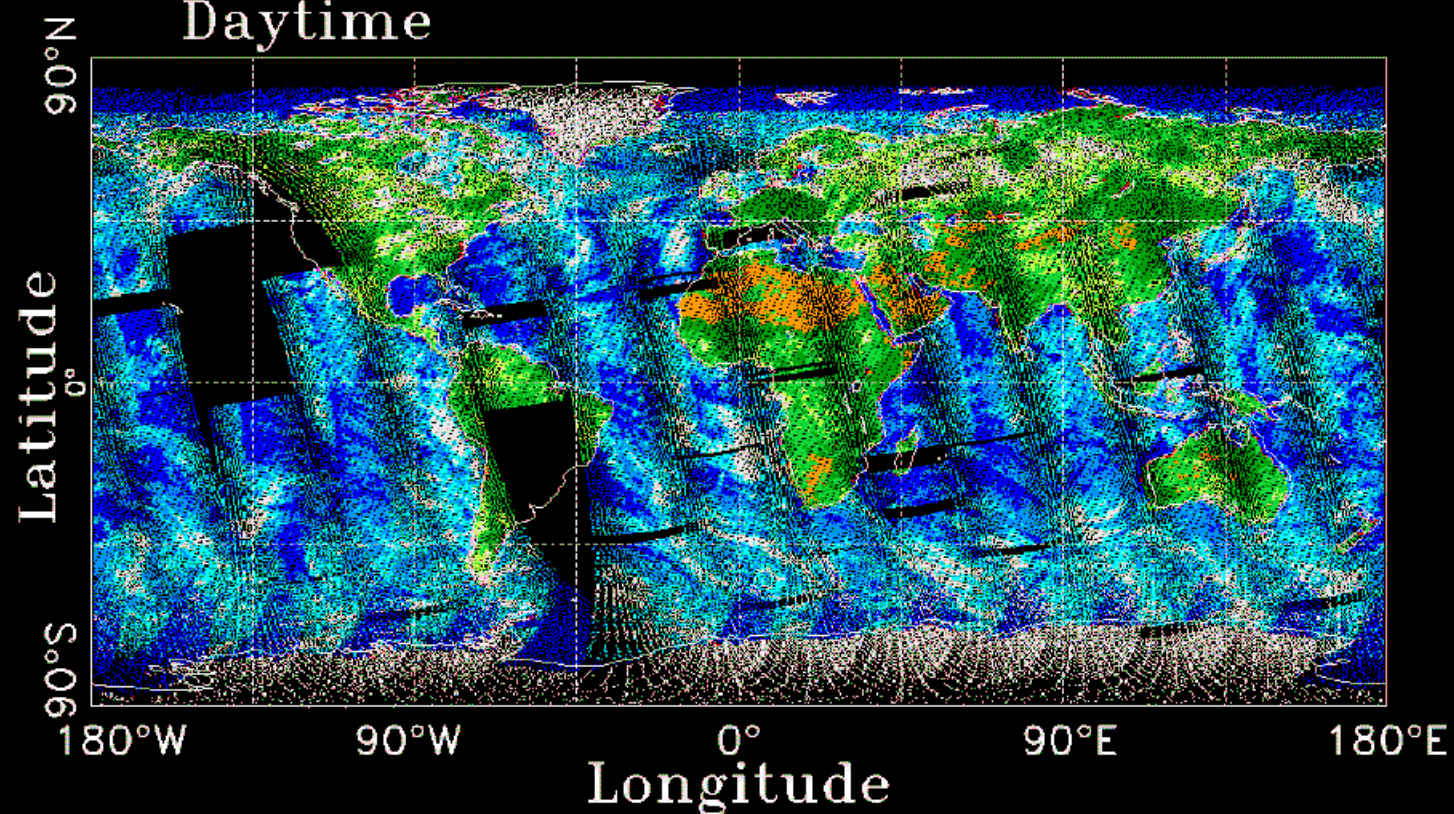
Start Time: 10/01/86

Satellite: NOAA-9

00:00:22

Hours plotted : 24

Scanner, Scene I.D. Daytime



S8 ERBE Plot geier Thu Mar 7 15:32:25 1996

Date Processed: 19/08/88

Satellite: ERBS

Orbits: 10810- 10824

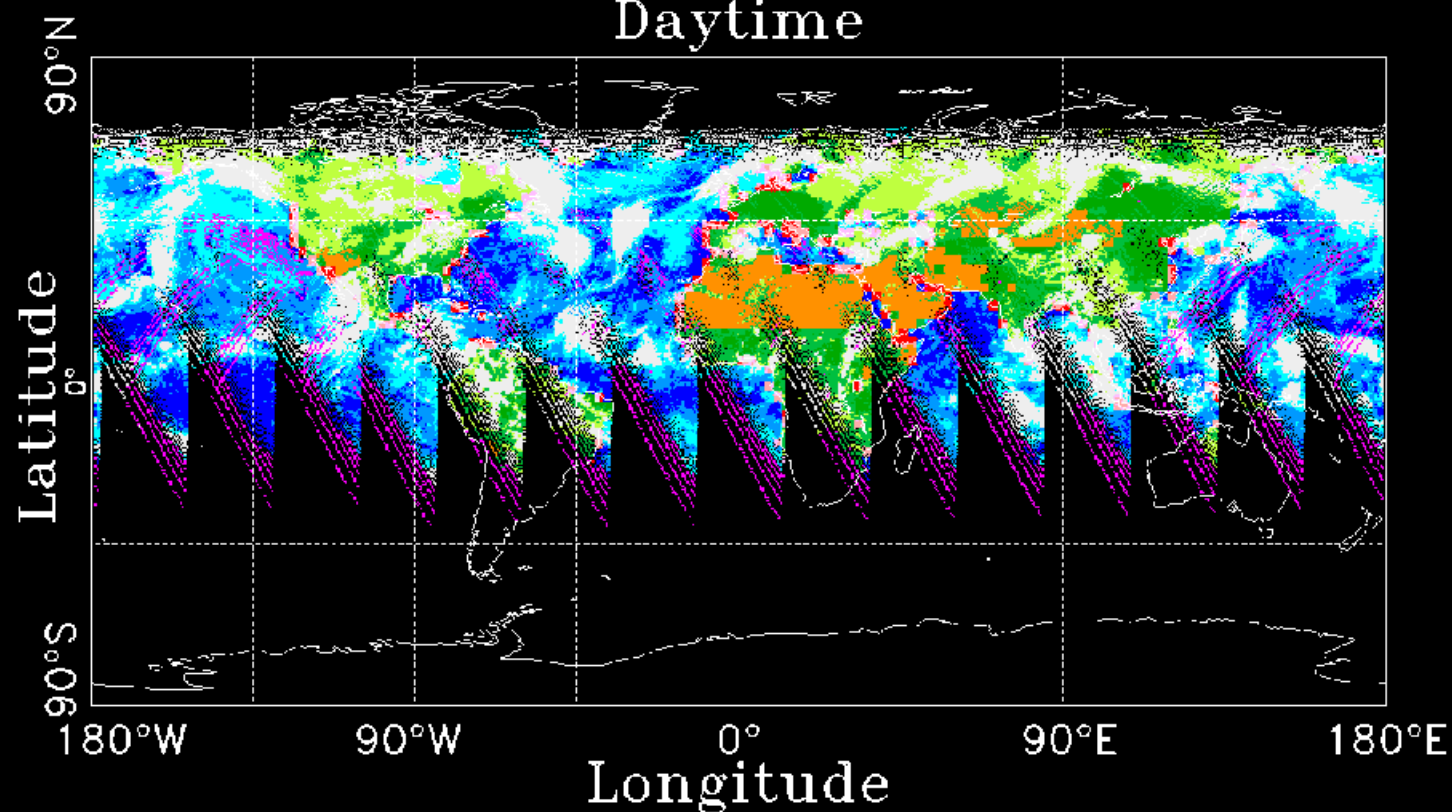
Data Start: 10/01/86

00:00:15

Data End: 10/01/86

23:51:27

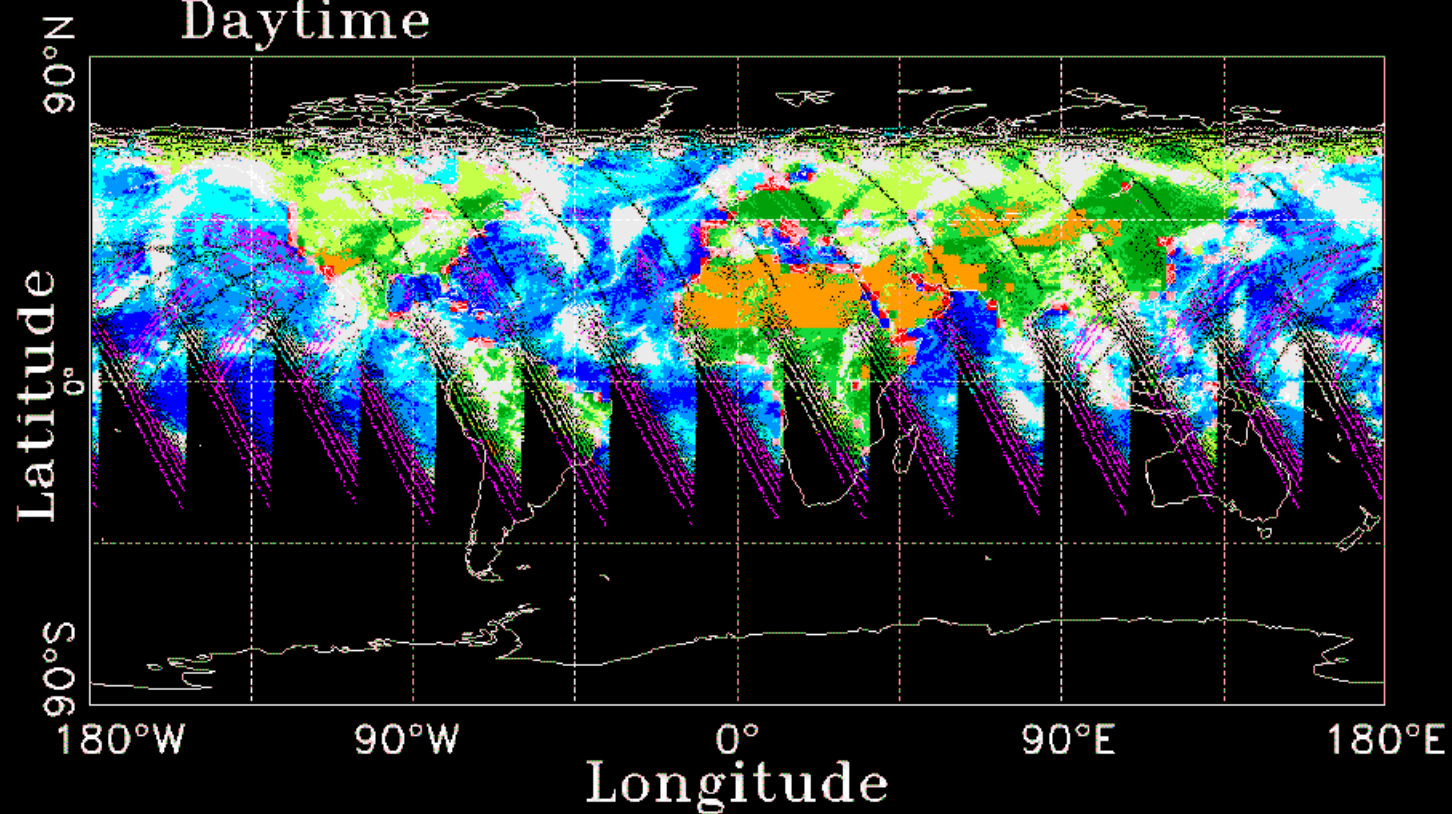
Scanner, Scene I.D. Daytime



Ovrest	Clear	PC	MC	Clear	PC	MC	Clear	Clear	Clear	PC	MC	Unknown
	Ocean	Ocean	Ocean	Land	Land/	Land/	Snow	Desert	Mix	Mix	Mix	
					Desert	Desert						

Scanner, Scene I.D.

Daytime

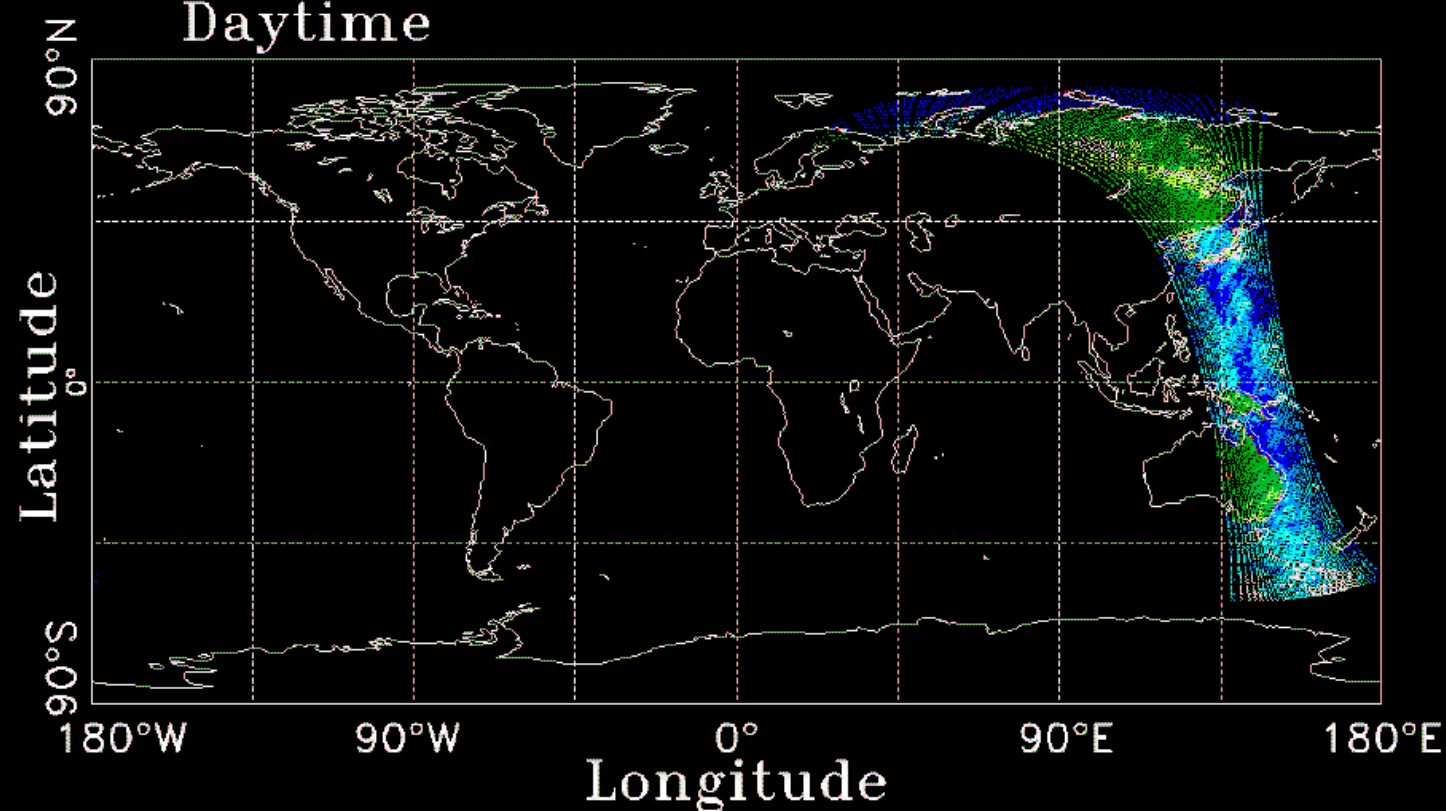


Ovrcst Clear PC MC Clear PC MC Clear Clear Clear PC MC Unknwn
Ocean Ocean Ocean Land Land/Desert Land/Desert Snow Desert Mix Mix Mix

Ceres SSF Plot geier Tue Mar 5 08:12:51 1996
Process Date:
Satellite: NOAA-9
Initial Orbit #: 9277

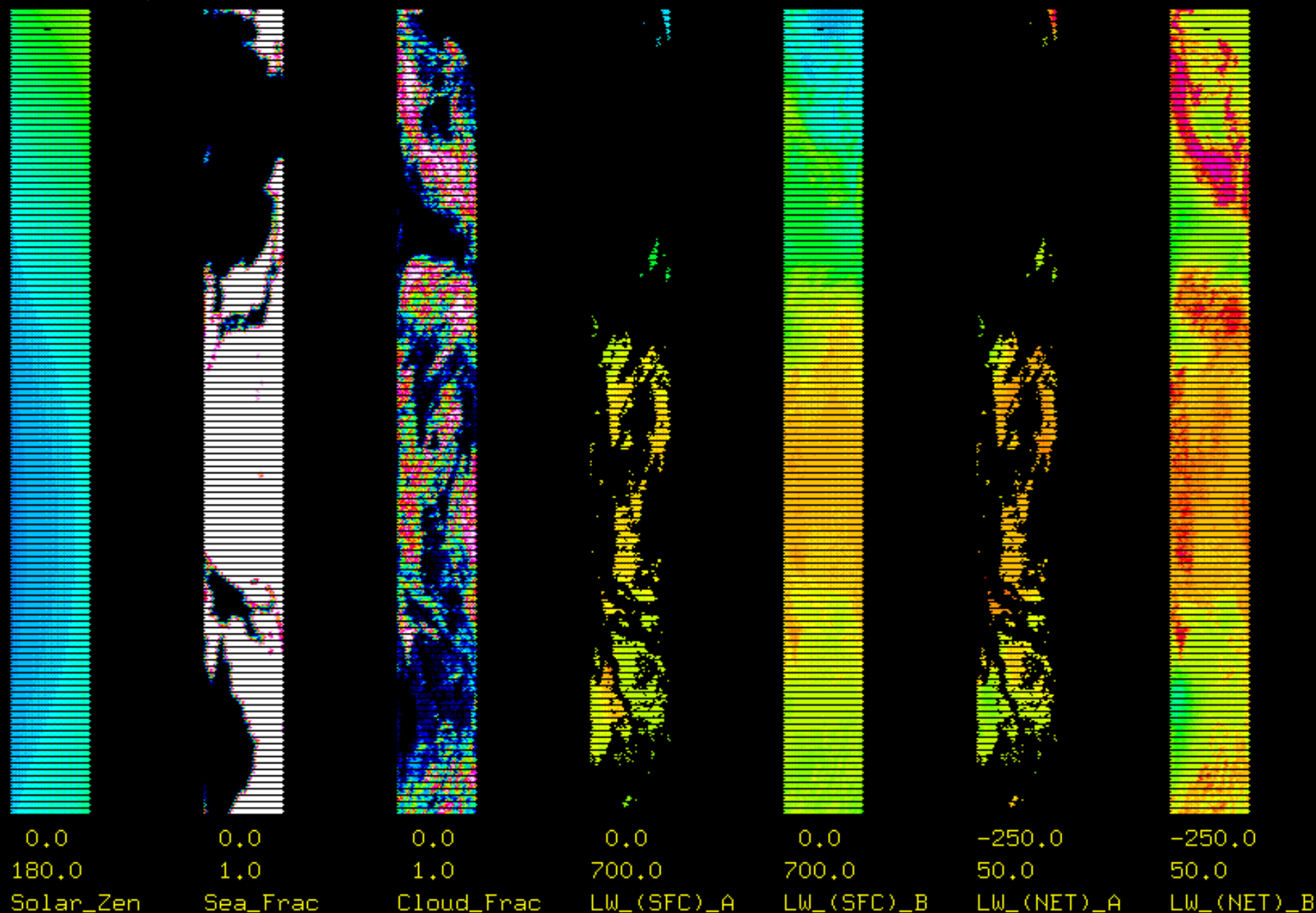
Start Time: 10/01/86
05:00:06
Hours plotted : 1

Scanner, Scene I.D. Daytime



SATELLITE: NOAA-9
FILENAME: SSF_19861001_05
SCANLINES: 100 - 600

INSTRUMENT: ERBE / AVHRR
DATA PRODUCT: CERES SSF



Working Group: SARB - Surface and Atmospheric Radiation Budget

Responsible for:

- **Subsystem 5 (Compute Surface and Atmospheric Fluxes)**
- **Subsystem 7.2 (Synoptic Flux Computation)**
- **Subsystem 12 (Regrid Humidity and Temperature Fields (NCEP))**

Data Products:

- **CRS (Single Satellite Footprint, and Radiative Fluxes and Clouds)**
- **SYN (Synoptic Radiative Fluxes and Clouds)**
- **MOA (Meteorological, Ozone, and Aerosol)**
- **MWH, APD, GAP, OPD External Ancillary Data Inputs**

Current Status:

- **Subsystem 12 was delivered to the Langley DAAC on February 29, 1996**
- **Subsystems 5 and 7.2 nearing completion.**

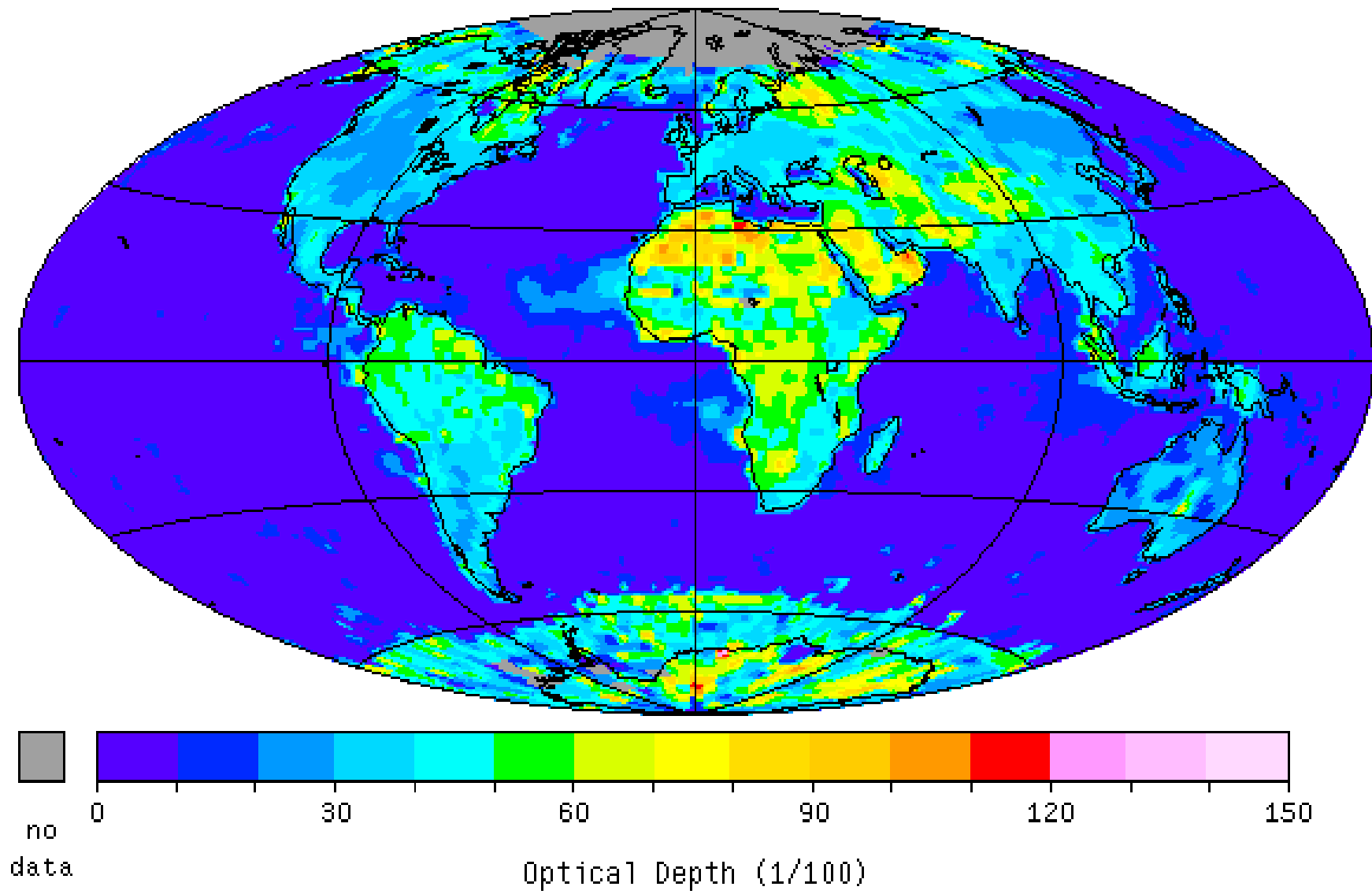
Near-term Plans:

- **Prepare a version of Subsystem 12 that uses the Goddard DAO meteorological data.**
- **Subsystems 5 and 7.2 delivered to the Langley DAAC on March 21, and 28, respectively.**
- **Complete architectural design documents.**

MOA - Monthly Aerosol Product

October, 1986

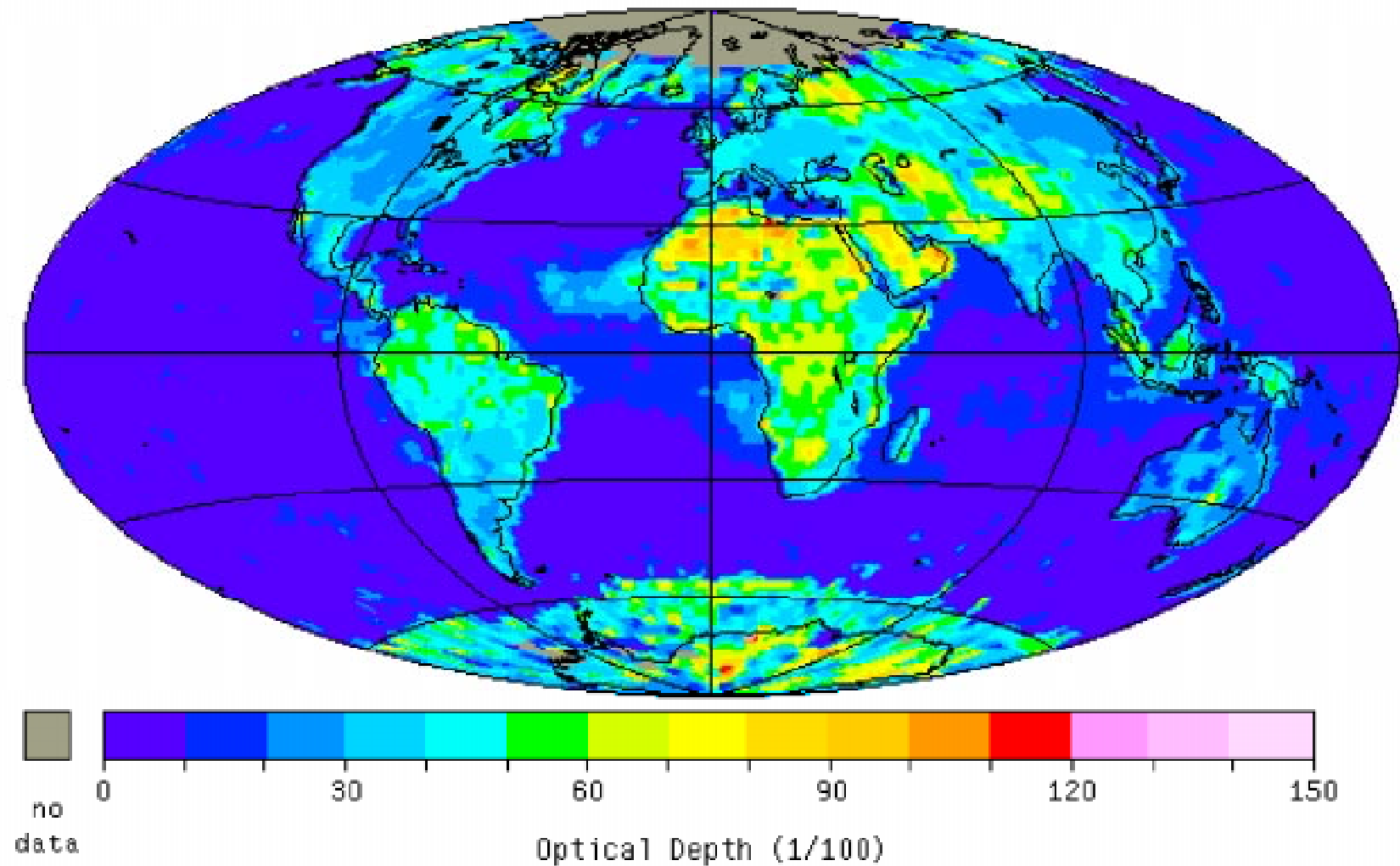
Combined Pinker and Stowe Products



MOA Monthly Aerosol

October, 1986

Combined Pinker and Stowe Products



1.25 Degree Equal Area

Working Group: TISA - Time Interpolation and Spatial Averaging

Responsible for:

- **Subsystem 6 (Hourly Gridded Single Satellite Fluxes and Clouds)**
- **Subsystem 7.1 (Time Interpolation for Single and Multiple Satellites)**
- **Subsystem 8 (Compute Regional, Zonal and Global Averages)**
- **Subsystem 9 (Grid TOA and Surface Fluxes)**
- **Subsystem 10 (Compute Monthly and Regional TOA and SRB Averages)**
- **Subsystem 11 (Grid Geostationary Data)**

Data Products:

- **FSW - Hourly Gridded Single Satellite Fluxes and Clouds (Subsystem 6)**
- **SYN - Synoptic Radiative Fluxes and Clouds (Subsystem 7)**
- **AVG, ZAVG - Monthly Regional, Zonal and Global Radiative Fluxes and Clouds (Subsystem 8)**
- **SFC - Hourly Gridded Single Satellite TOA and Surface Fluxes (Subsystem 9)**
- **SRBAVG - Monthly Regional TOA and SRB Average, 1.25 Grid (Subsystem 10)**
- **GGEO - Ancillary Data Product: Gridded ISCCP Geostationary Data (Subsystem 11)**

Current Status:

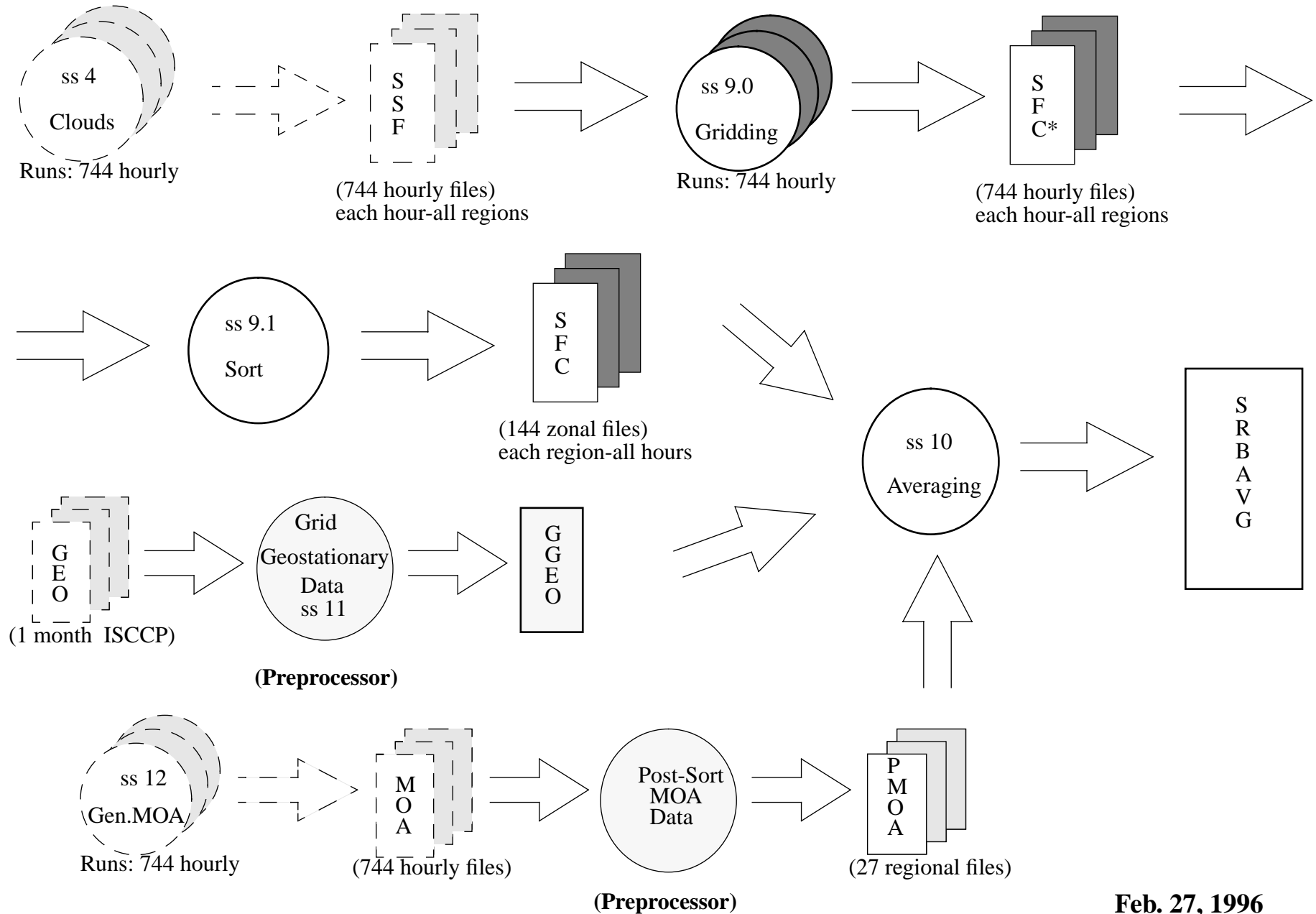
- **Redesigned to combine ss7.1, 8 and 10 as one executable; Incorporated surface flux algorithms into ss10**
- **Redesigned ss9 code to combine ss6 and 9 as one executable**
- **Porting and testing all subsystems software on SCF**
- **Drafting subsystem Test Plans and Delivery Memo Documents for DAAC deliveries (ss7.1, 10, 11 complete)**
- **Created pre and post processors to handle 'large number of files' limitation problem**

Near-Term Plans:

- **Add Quality Control Report features to all subsystems.**
- **Add footprint smoothing algorithm to Gridding subsystems (ss6 and ss9)**
- **More testing - 15 day test, one month stress test**
- **Begin planning for Release 2: Multiple satellite, HDF, metadata, product headers, code refinements and corrections to Release 1, data products update, and modify ISCCP B3 data usage to B1data**

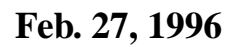
CERES Time Interpolation and Spatial Averaging

TOA and SRB Gridding and Averaging Processes and Data Flow Scenario

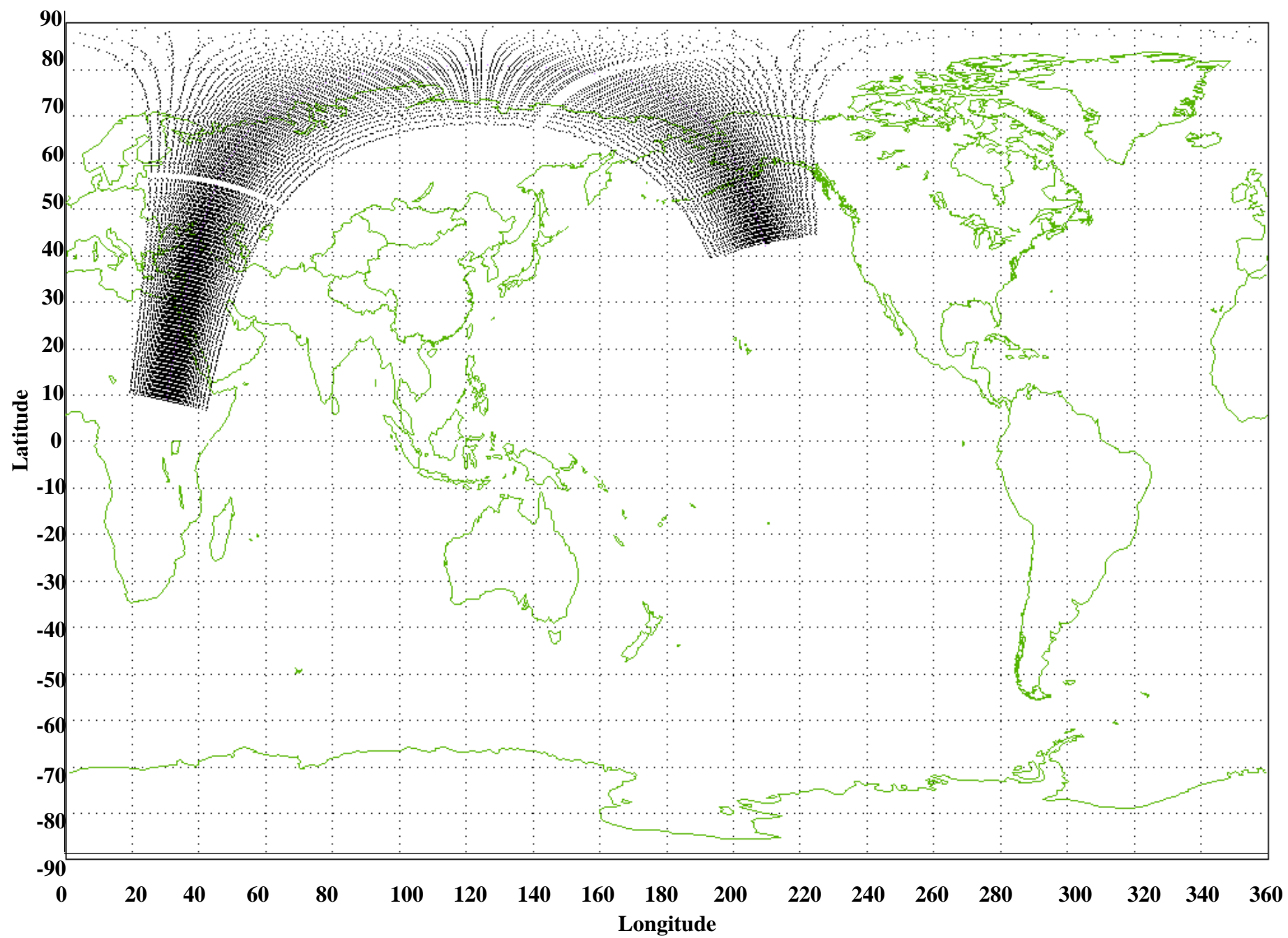


Feb. 27, 1996

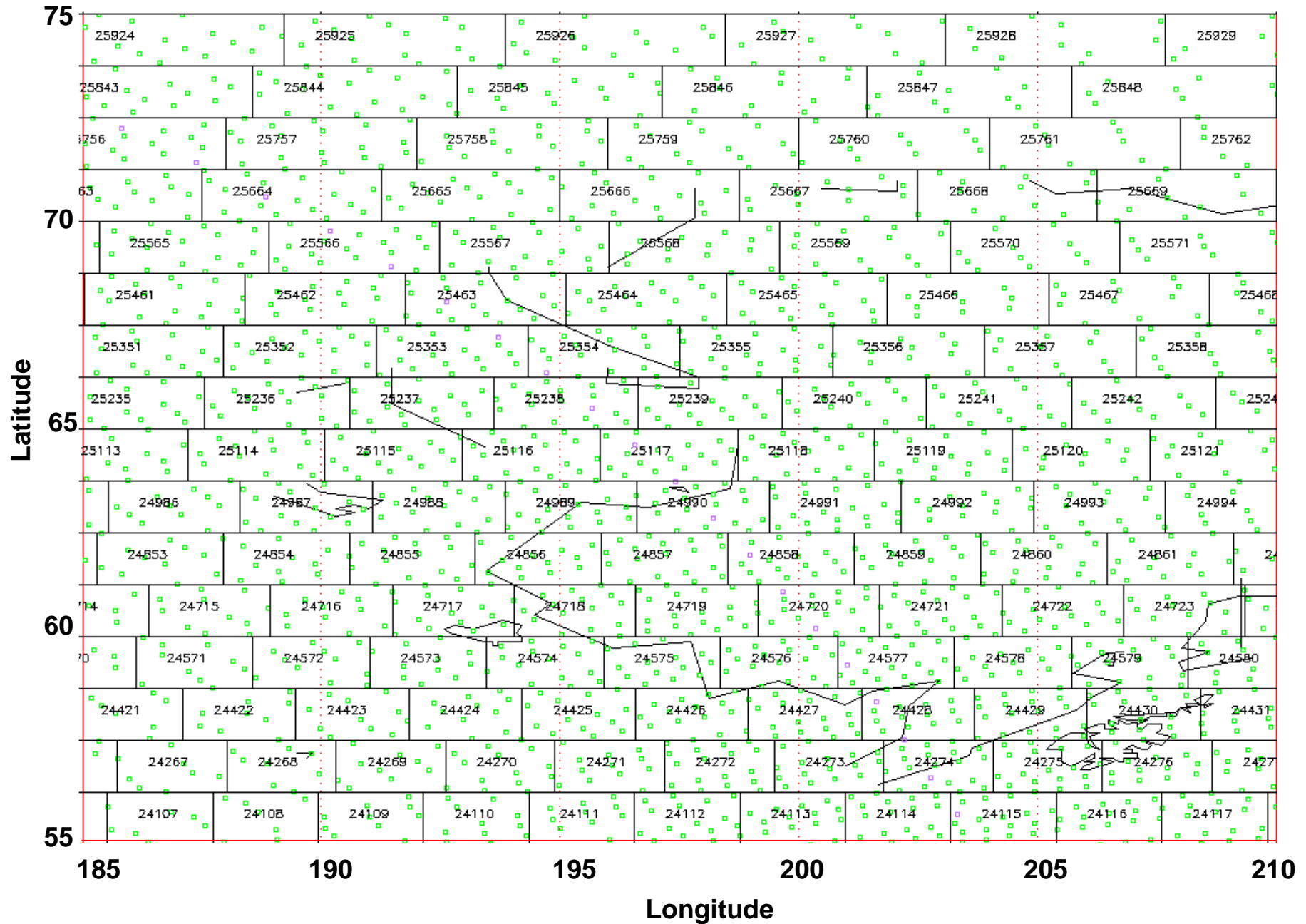
Synoptic Gridding and Averaging Processes and Data Flow Scenario



SSF FOOTPRINT PLOT



FOOTPRINT PLOT (ZOOMED)



Validation and Visualization Aids

Develop tools for visualizing CERES data products to assist software development and support production processing and validation - understand the data and identify discrepancies

- **INTERACTIVE visualization of any element within data product**
- **2D strip charts for quick look at 'raw' footprint data (IES, SSF, CRS, ...)**
- **Global map projections (Hammer-Aitoff, Orthographic, Lambert Cylindrical, ...)**
- **Arbitrary slice through atmosphere - global or regional**
- **Isosurface, particle trace, animation, ...**

Tools & Current Status:

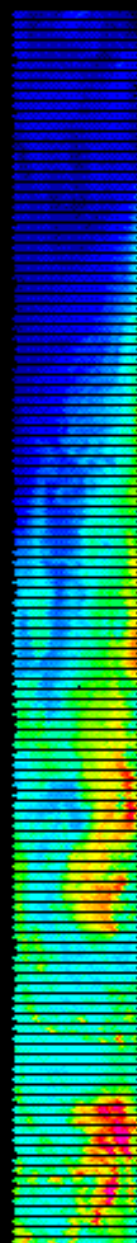
- **Developed initial capabilities w/ Release 1 SSF (footprint) & MOA (gridded) data**
- **Developed interactive OpenGL multi-channel color strip charts**
- **Latitude-longitude global plots (NCAR, FAST, IBM Data Explorer, IDL, ...)**
- **3D Interactive Visualization & Analysis (FAST)**
 - **Modified to use CIA map database and NAVY digital elevation map**
 - **Modified to support 2D projections (Hammer-Aitoff & many others ...)**
 - **Supports 3D global projection with interactive inspection**
 - **Supports arbitrary slice through the atmosphere - global or regional**
 - **Supports CERES unstructured grid (3D, includes height)**

Near Term Development:

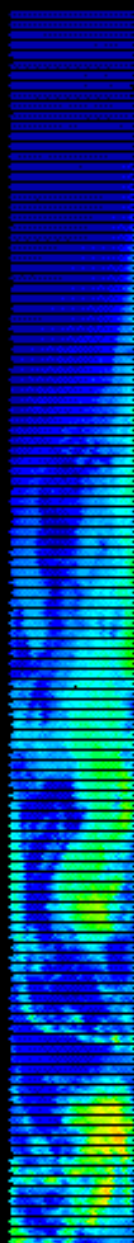
- **Modify GUI Data Selector to support all CERES HDF files (look at EOSView)**
- **Develop interfaces for all archival and validation products**
- **Develop tools to run on both SUN and SGI platforms (OpenGL)**

SATELLITE: NOAA-9
FILENAME: SSF_19861001_17
SCANLINES: 200 - 700

INSTRUMENT: ERBE / AVHRR
DATA PRODUCT: CERES SSF



40.0
250.0
Total



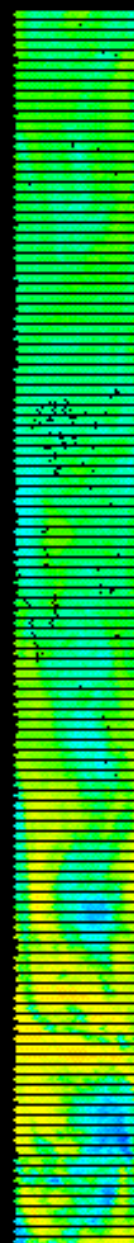
-20.0
250.0
Shortwave



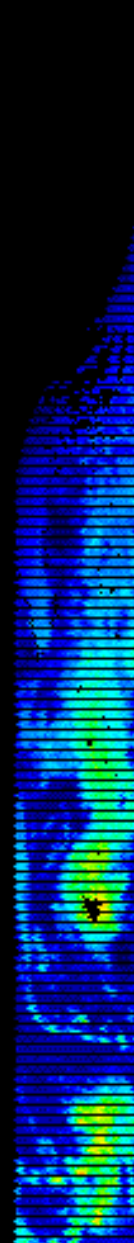
10.0
70.0
Longwave



0.0
12.0
Scene_ID



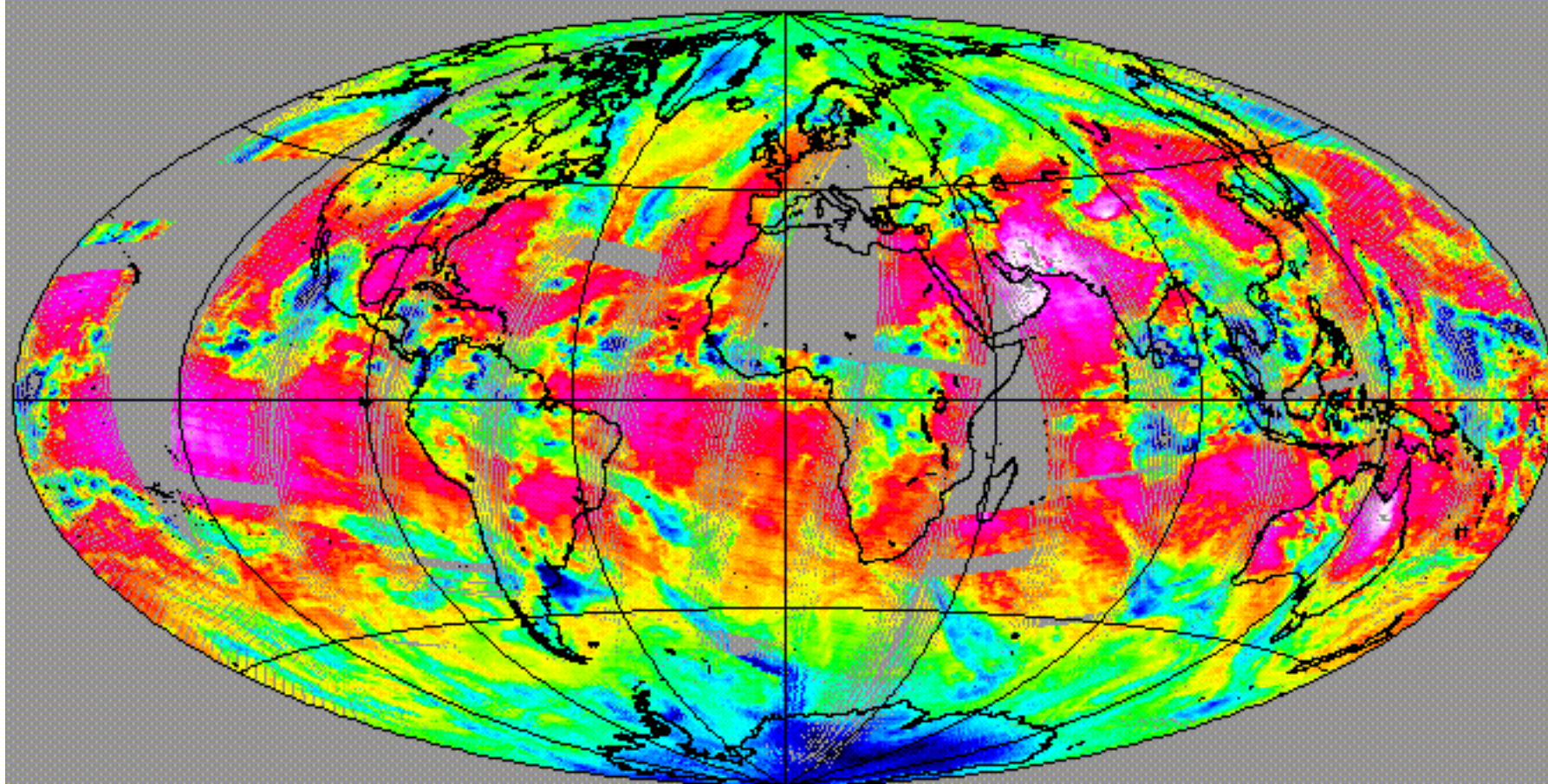
0.0
500.0
LW_(TOA)



0.0
1400.0
SW_(TOA)

TOA LW FLUX

CERES Processing (SSF Hours 00 – 11) October 1, 1986



W_m^{-2}

100.0

150.0

200.0

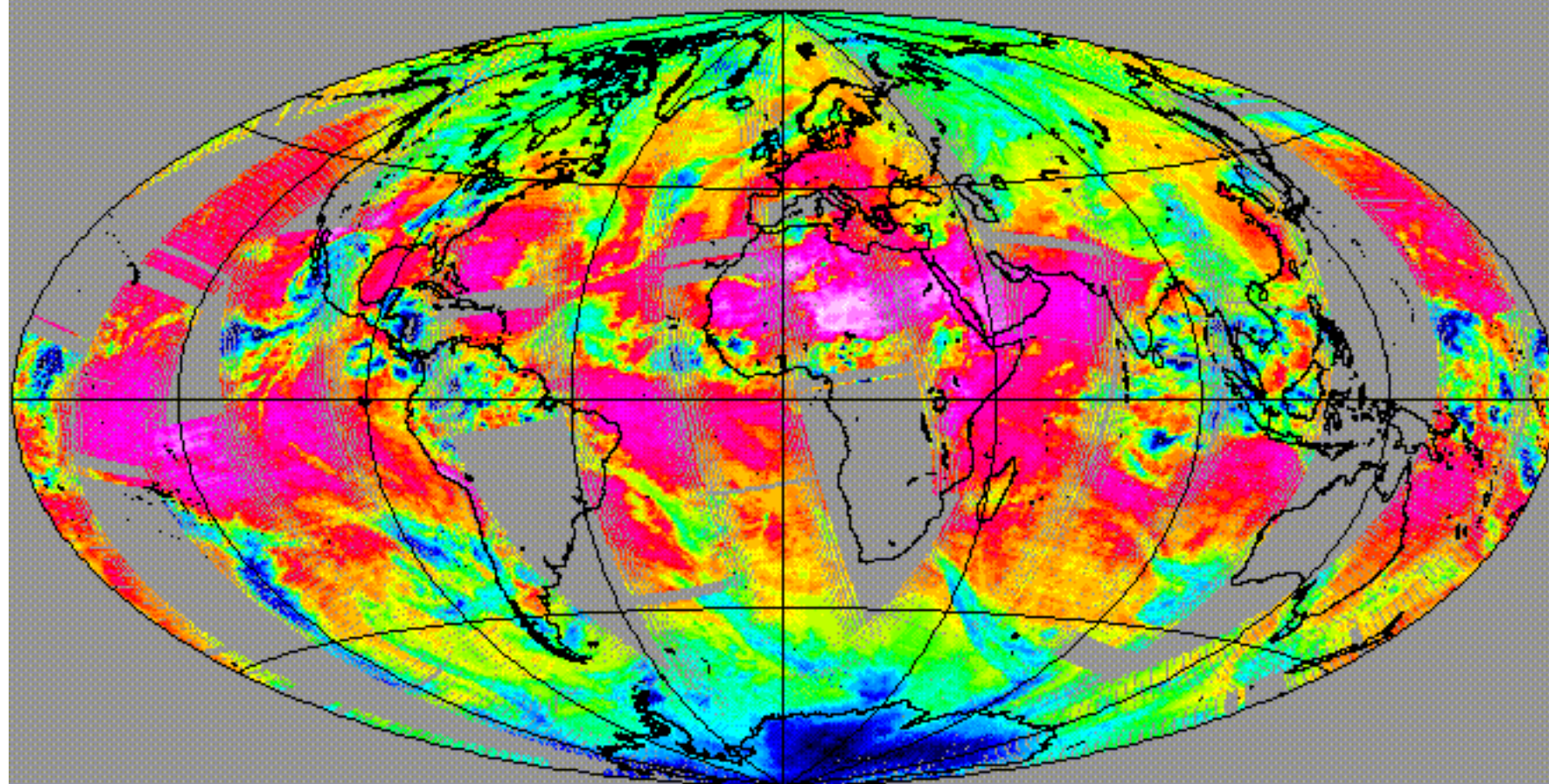
250.0

300.0

350.0

TOA LW FLUX

CERES Processing (SSF Hours 12 – 23) October 1, 1986



Wm^{-2}

100.0

150.0

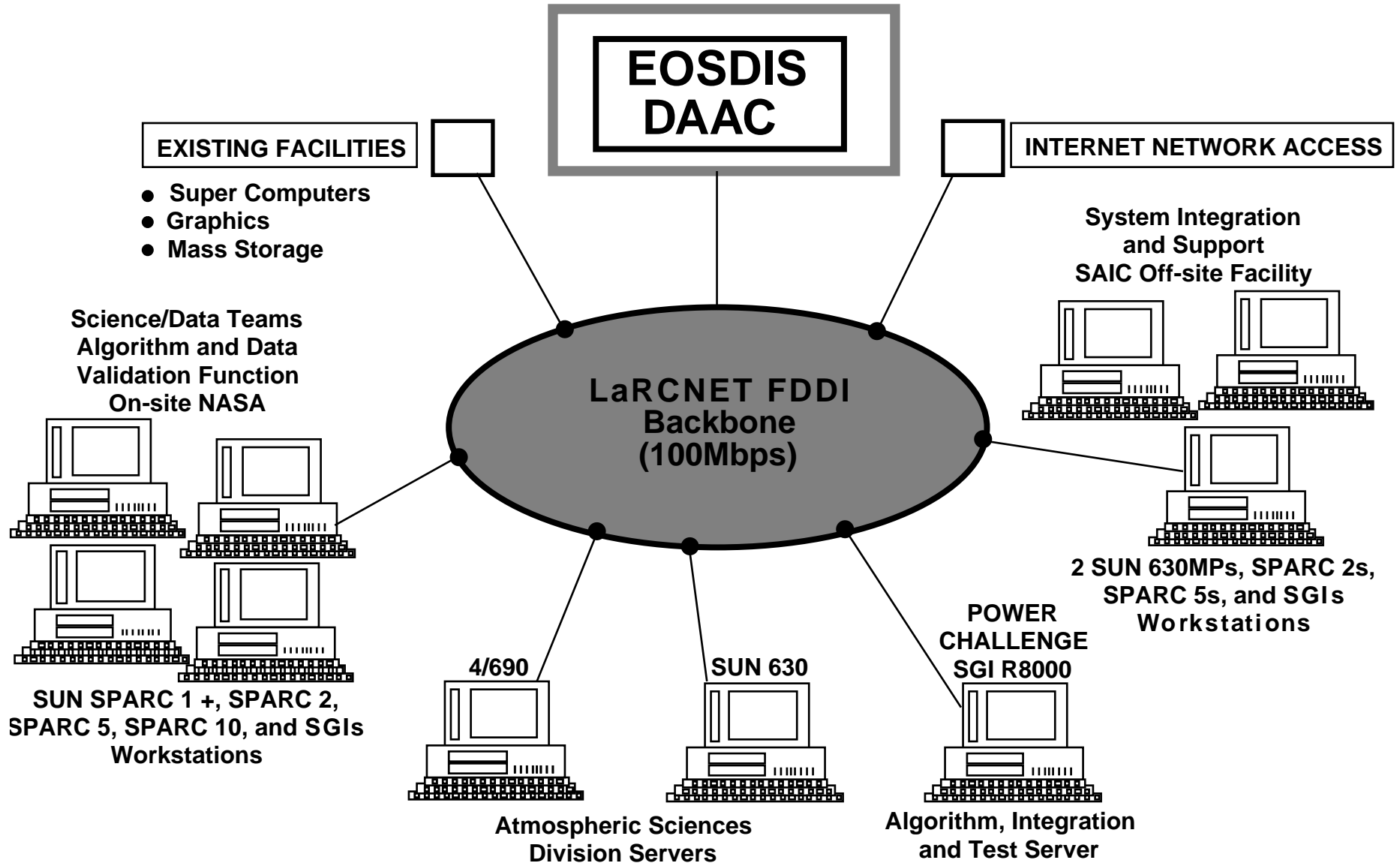
200.0

250.0

300.0

350.0

SCIENCE COMPUTING FACILITY OVERVIEW



Facility Task Lead - C. E. Mackey

Science Computing Facilities

- **Development and testing platform (SGI Power Challenge XL server)**
 - **Configured to match DAAC as closely as possible**
 - **8 R8000 MIPS processors**
 - **2 Gigabytes of memory**
 - **Configured 81G of local disk space**
 - **Upgraded to IRIX 6.1**
 - **Installed SGI & NAG Fortran 90**
 - **Installed 32-bit and 64-bit SDP Toolkit 5**
 - **Installed demo licensed copy of SGI Verdex Ada**
 - **114GB optical jukebox configured (transfer speeds are slow)**
 - **Accessing Distributed Mass Storage System (over 5 TB of available storage) through high speed FIDDI connection**
- **Configuring three tape stackers to back up all workstations**
- **Planning workstation upgrades from SunOS 4.1.3 to Solaris in July**
- **Planned FY 96 Acquisitions**
 - **13 Sparc 1+ workstation upgrades**
 - **4 Sparc IPC workstation upgrades**
 - **2 Sun 330MP upgrades**
 - **8 CPU upgrades for SGI Power Challenge**
 - **8 SGI INDY R5000 workstations**
 - **upgrade as many 4 - 5+ year old workstations as possible**

Some Metrics

- **Need a way to measure status, changes, quality, and productivity**
- **A good metric should be**
 - **Objective**
 - **Clearly defined**
 - **Easily observed**
 - **Uniformly applied**
 - **Frequently updated**
- **The act of measuring a process should not influence the process. However, since people are involved, we may change our behavior to tilt the measurements.**
- **Can't get carried away! Let's not spend more time measuring the process than we spend on the process itself.**
- **Some of the following measures may be useful. None of them capture the quality dimension.**

Non-EOS Ancillary Data Sets Required for CERES on TRMM

IRD Ref	CERES Field ID	AHWGP Field ID	Data Set	Source	Size/ Frequency
2	APD (Column)	CERX10	Aerosol global analyzed field (optical depth units)100km Analyzed Field File - global 1 deg map of total aerosol optical thickness	NOAA/NESDIS	1.4 Mb/week
3	APD (Strat)	CERX??	SAGE thin stratospheric aerosol optical depth	LARC DAAC	
4	OPD (Strat)	CERX??	SAGE stratospheric ozone	LARC DAAC	
5	OPD (Column)	CERX11	NESDIS Layer/Level Ozone - NOAA 14 POES SBUV/2 total ozone levels at 30, 10, 5, 2, 1, 0.4 hPa in mixing ratio (10*-3g/g) on NMC 65 by 65 polar stereographic grid for both hemispheres	NOAA/NESDIS	2 Mb/day
6	MWH	CERX13	SSM/I Integrated Water Vapor Daily -.5 by .5 deg lat/lon	MSFC DAAC	3.5 Mb/day
7	GAP(3-D)	CERX12	DAO gridded geopotential, wind speed, water vapor, layered atmospheric temperature; 6 hourly snapshots on 144 by 91 grid NCEP 28-level Sigma File	DAO GSFC or NCEP	821 Mb/mon 220 Mb/mon
8,9	GAP(Sfc)	CERX12	Surface skin temperature - 3 hour averages, globally on 144 by 91 grid / NCEP Flux File H2D	DAO GSFC or NCEP	550 Mb/mon 200 Mb/mon
11	CID_VIRS	CERX05	VIRS Cloud Imager Data	GSFC DAAC	
14 15	SURFMAP (snow) SURFMAP (ice)	CERX??	Snow/Ice Cover from DMSP SSM/I. Available every 6 hours; requesting 1 / day global data set; 48 km at 60 deg lat. 1 file / hemisphere for 2 (10,11) DMSP satellites	NOAA/NESDIS	42 Mb/day
16	SURFMAP(veg)	CERX??	Vegetation index from NOAA POES AVHRR. Plate Carree projection - 16km resolution. 75 deg N to 55 deg S	NOAA/NESDIS	2.3 Mb/week
17	GEO	CERX09	ISCCP B1 counts; 3 hourly	NOAA	200 Mb/day
1	MWP	CERX13	Microwave Liquid Water Path	DELETE	
10	CID_MODIS	CERX04	MODIS Cloud Imager Data	GSFC DAAC	
12	SURFMAP (DEM)		Digital Elevation Map	Toolkit	
13	SURFMAP (H2O)		Water Conditions	DELETE	

Estimated Size of Intermediate and Archival Data Products - 6/95

Working Group	Subsystem	Total I/O Per Run, MB	Archived Per Run, MB	Runs per Data Month	Archived per Data Month, MB
Instrument	1.0 Geolocate and Calibration	1546	627	31	19437
ERBE-Like	2.0 Inversion to TOA	903	276	31	8550
	3.0 Averaging to Monthly TOA	676	574	1	574
Clouds	4.1 - 4.3 Cloud Property Retrieval	1016	14	744	10416
Inversion	4.4 Footprint Convolution	1006		744	
	4.5 - 4.6 TOA and SRB Estimation	678	324	744	241056
SARB	5.0 Surface and Atmospheric Fluxes	857	439	744	326616
	7.2 Synoptic Flux Computation	214	66	248	16368
	12.0 Regrid MOA Fields	32	30	744	22320
TISA	6.1 Hourly Fluxes and Clouds, Gridding	493		744	
	6.2 Hourly Fluxes and Clouds, Region Sort	12420	6210	1	6210
	7.1 Single/Mult Satellite Time Interpolation	6823	54	248	13392
	8.0 Regional, Zonal and Global Averages	802	733	1	733
	9.1 TOA and Surface Fluxes, Gridding	361		744	
	9.2 TOA and Surface Fluxes, Region Sort	6250	3125	1	3125
	10.0 Monthly and Regional TOA and SRB	4814	1129	1	1129
	11.0 Grid Geosynchronous Data	1466	524	1	524
Total		40357	14125	5772	670450

Estimated Pages of Documentation - 3/96

Working Group	Subsystem	Algorithm Theoretical Basis	Software Requirements	Architectural Design	Test Plan
Instrument	1.0 Geolocate and Calibration	62	160	18	35
ERBE-Like	2.0 Inversion to TOA	30	35	None Written	52
	3.0 Averaging to Monthly TOA	38	28		
Clouds	4.1 - 4.3 Cloud Property Retrieval	157	105	25	25
	4.4 Footprint Convolution	24	20	28	17
Inversion	4.5 - 4.6 TOA and SRB Estimation	49	42	25	25
SARB	5.0 Surface and Atmospheric Fluxes	59	31	18	21
	7.2 Synoptic Flux Computation	See 7.1	17	17	21
	12.0 Regrid MOA Fields	17	38	20	21
TISA	6.1 Hourly Fluxes and Clouds, Gridding	27	45	20	30
	6.2 Hourly Fluxes and Clouds, Region Sort				
	7.1 Single/Mult Satellite Time Interpolation	45	46	18	38
	8.0 Regional, Zonal and Global Averages	23	38	23	38
	9.1 TOA and Surface Fluxes, Gridding	16	36	See 6.1	See 6.1
	9.2 TOA and Surface Fluxes, Region Sort				
	10.0 Monthly and Regional TOA and SRB	22	59	23	38
	11.0 Grid Geosynchronous Data	11	None	15	25
Total Pages: 1916		580	700	250	386

Estimated Source Code for each CERES PGE - 3/96

Working Group	SS	PGE	Code Lines	Number of Modules	Average Module	Since 12/95
Instrument	1.0	Instrument	48760	154	316	+18760
ERBE-like	2.0	INV	10562	32	330	
	3.0	DDBINT	588	3	196	
	3.0	DDBUPD	2780	16	174	
	3.0	DDBUER	1214	7	173	
	3.0	DDBSRT	1420	10	142	
	3.0	MTSA1	3442	9	382	
	3.0	MTSA0	3036	22	138	
	3.0	MTSA3	2929	9	325	
	3.0	PRES4	1209	7	173	
	3.0	ES4	5486	35	157	
	3.0	TSALIB	6200	41	151	
	2&3	SCNLIB	1530	20	77	
	Total		40396	211	191	+20586
Clouds Inversion	4.1	Cloud Retrieval	65000	750	87	
	4.4	Footprint Convolution	11700	50	234	
	4.5	TOA/Surface Fluxes	3941	16	246	
	4.6	In CERESlib	(2789)	(4)	(697)	
	Total		80641	816	99	+43441

Estimated Source Code for each CERES PGE - 3/96

Working Group	SS	PGE	Code Lines	Number of Modules	Average Module	Since 12/95
SARB	5.0	Instantaneous SARB	300	4	75	
	7.2	Synoptic SARB	300	4	75	
		Shared SARB Library	9766	85	115	
	12.0	MOA Regridding	9577	61	157	
	Total		19943	154	130	+993
TISA	6.0/6.1/9.0/9.1	Atmos/Surface Gridding	16338	176	93	
	7.1/8.0/10.0	Regional & Synoptic Avg	23366	237	99	
	7.1/10.0	Postprocess MOA	265	2	133	
	7.1	Merge Satellites	8000	40	200	
	11.0/11.1	Grid Geostationary	6823	99	69	
	Total		54792	554	99	-13468
System		CERESlib & Utilities	21950	223	98	+16950
System Total			276248	2197	126	+87262

Number of Files for each CERES PGE - 3/96

Working Group	SS	PGE	Number of Input Files	Number of Output Files
Instrument	1.0	Instrument	20	30
ERBE-like	2.0	INV	7	6
	3.0	DDBINT	1	2
	3.0	DDBUPD	41	40
	3.0	DDBUER	39	39
	3.0	DDBSRT	41	43
	3.0	MTSA1	41	9
	3.0	MTSA0	9	3
	3.0	MTSA3	6	9
	3.0	PRES4	3	2
	3.0	ES4	5	8
	Total		193	161
Clouds	4.1	Cloud Retrieval	89	5
	4.4	Footprint Convolution	3	3
Inversion	4.5	TOA/Surface Fluxes	5	2
	Total		97	10

Number of Files for each CERES PGE - 3/96

Working Group	SS	PGE	Number of Input Files	Number of Output Files
SARB	5.0	Instantaneous SARB	7	1
	7.2	Synoptic SARB	7	1
	12.0	MOA Regridding	11	24
	Total		25	26
TISA	6.0	Atmospheric Gridding	1	1
	6.1	Atm. Gridding postprocess	744	144
	7.1/8/10	Regional & Synoptic Avg	383	44
	7.1/10	Postprocess MOA	744	27
	7.1	Merge Satellites	288	41
	9.0	Surface Gridding	1	1
	9.1	Srf. Gridding postprocess	744	144
	11.0	Grid Geostationary	129	1
	11.1	GGEO postprocess	10	1
	Total		3044	404
System		CERESlib & Utilities	N/A	N/A
System Total			3379	631

PGE Size as Delivered to LaRC DAAC - 3/96

Working Group	SS	PGE	Delivery Date	Software, Bytes				Data, MBytes	
				Code	Scripts	SMF/PCF	Misc	Input	Output
Instrument	1.0	Instrument	2/16/96	2333040	17459	79149	6062707	.39	3.5
ERBE-like	2.0 & 3.0	Daily and Monthly	2/15/96	1385374	93015	12082	40510	82	632
Clouds	4.1	Cloud Retrieval	3/07/96	2301391	24892	14215	0	273	115
	4.4	Footprint Convolution	3/07/96	354974	988	14234	4594	617	43
Inversion	4.5	TOA/Surface Fluxes	3/06/96	137563	2123	4445	0	84	42
SARB	5.0	Instantaneous SARB	3/21/96						
	7.2	Synoptic SARB	3/28/96						
	12.0	MOA Regridding	3/01/96	296283	4049	22497	22923	12	986
TISA	6.0/6.1	Atmospheric Gridding	3/21/96	(ss9)	(ss9)	22241	0	37	12
	7.1/8/10	Regional & Synoptic Avg	3/14/96	699674	2105	51072	337	679	1161
	7.1/10	Postprocess MOA	3/14/96	46121	574	12136	540	986	464
	7.1	Merge Satellites	3/28/96						
	9.0/9.1	Surface Gridding	3/14/96	475224	3828	21204	0	26	6
	11.0/11.1	Grid Geostationary	3/05/96	217806	1120	24776	0	705	452
System		CERESlib & Utilities	2/26/96	739723	0	8061	2694	0	0
System Total									

System-Wide Release 2 Issues

Decide on final grid system (ripples everywhere)

Produce all archival data products in Hierarchical Data Format (EOS-HDF)

Finalize required metadata for every data product

Use mandatory SDP Toolkit calls and test new Toolkit releases

Produce realistic measurements of computer system resource requirements

Define and implement QC reports: statistical summaries output from each PGE to convince us things are working or identify problems

Update all documentation and expand as needed

Define Release 1 delivery as 'baseline' for configuration management. Objectives:

- Has the software been moved correctly from "thunder" to the DAAC.**
- Can the DAAC manage the monthly data volumes that the CERES software will produce?**

Release 2 Issues for Each Working Group

Instrument:

- **Planned Release 2 functions:**
 - Solar calibration processing
 - Diagnostic packet processing
- **Add coastline detection for geolocation validation**
- **Unplanned to account for instrument anomalies:**
 - 'Second time constant' unfiltering
 - Azimuth and elevation beam misalignment corrections

ERBE-Like:

- **Final CERES spectral correction coefficients**
- **New ERBE ADMs**
- **Calibration problems for both NOAA 9 and NOAA 10 (ERBE Reprocessing)**

Clouds:

- **Simulate all launch data sets and write input routines**
 - VIRS, MODIS, TMI, MWP, SSM/I, snow/ice surface maps,
- **Update current science algorithms with new releases**
- **Add in new science algorithms with input and output interfaces**
- **Input validation site lat/lon table, add val choice to input in process control file, add logic to capture pixels/footprints, and output to val file**
- **Update data product catalogs, Interface Requirements Doc for external ancillary data, design docs, user's guides, all other documentation**
- **Test with CERES Point Spread Function option in addition to ERBE PSF.**

Release 2 Issues for Each Working Group

Inversion:

- **Use final CERES spectral correction coefficients**
- **Incorporate new land and sea type definitions**
- **Re-design IES, SSF and CRS to remove redundancy and include needed items**
- **Update SW and LW surface estimation algorithms as needed**

SARB:

- **Use the Fu-Liou model with revised correlated-k distributions to simulate the 8-12 micron window flux. (Operational)**
- **As strongly suggested by the Science Team, develop an algorithm that tunes the atmospheric fluxes to the estimated surface flux. (Operational)**
- **Develop a simulation of imager radiances (VIRS, MODIS, AVHRR). This is a research product for validation and quality control.**
- **Subsystem 12.0: The only expected changes for MOA are directly related to any changes in the input products. (likely an ongoing problem...)**

TISA:

- **Special averaging for 'weighted-column-averaged-cloud' properties**
- **Additional validation requests from Science Team**
- **Change ISCCP data from B3 to B1 and 'fall out' changes**
- **Add multiple satellite logic**
- **Include cubic spline averaging algorithm**

Near-Term Plans

- **Complete Release 1 science algorithm deliveries and integration at LaRC DAAC**
- **Benchmark results from production-level stress test and one month testing**
- **Kickoff Release 2 development with lessons-learned and changes to requirements**
 - **Hold architectural design overviews of Release 1 functionality**
 - **Need early decisions on external interfaces and archival data products**

Issues for Discussion

- **What is status of AM-1 deep-space calibration maneuver?**
- **Will the TRMM IST's be allowed "dual connection" on MODNET/NOLAN?**
- **IR-1 has insufficient disk space for CERES test of a full month of data products (>670 GB)**
Alternatives:
 - **Allow FDDI connection to Langley mass storage system - CERES buys the card**
 - **ECS purchase more disk or staging storage**
- **EOS View (HDF data product viewer) crashes on our IES & SSF test HDF files.**
Is there a 1MB limit on size of HDF files? Help!